

(19)

Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 831 429 A2

(12)

## EUROPEAN PATENT APPLICATION

(43) Date of publication:

25.03.1998 Bulletin 1998/13

(51) Int. Cl.<sup>6</sup>: G07D 1/02

(21) Application number: 97116387.8

(22) Date of filing: 19.09.1997

(84) Designated Contracting States:

AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC  
NL PT SE

(30) Priority: 20.09.1996 JP 250680/96

24.09.1996 JP 252035/96

12.09.1997 JP 248833/97

(72) Inventors:

- Chiba, Hiroshi  
Kawaguchi-shi, Saitama-ken (JP)
- Ebihara, Hideyuki  
Hachioji-shi, Tokyo (JP)
- Sakamoto, Mitsuo  
Omiya-shi, Saitama-ken (JP)

(71) Applicant:

LAUREL BANK MACHINES CO., LTD.  
Tokyo (JP)

(74) Representative:

Laufhütte, Dieter, Dr.-Ing. et al  
Lorenz-Seidler-Gossel  
Widenmayerstrasse 23  
80538 München (DE)

## (54) Coin receiving and dispensing machine

(57) A coin receiving and dispensing machine includes a plurality of dispensable coin storing units for storing coins for dispensation in accordance with their denominations, each of the plurality of dispensable coin storing units including a conveyor belt inclined so that a feed-out end portion from which coins are fed out is disposed upward, a separation roller disposed above the conveyor belts in the vicinity of the feed-out end portions of the plurality of dispensable coin storing units so that a clearance between the conveyor belts and itself is a predetermined distance and rotatable in a direction reverse to a coin convey direction of the conveyor belts, a support plate for receiving coins from the feed-out end portions of the plurality of dispensable coin storing units and supporting them on an upper surface thereof, a plurality of dispensing rollers provided so as to correspond to the plurality of dispensable coin storing units, disposed above the support plate so that clearances between the support plate and themselves are predetermined distances and rotatable at higher speed than the coin convey speed of the conveyor belts, a plurality of sensors for detecting coins fed out from the feed-out end portions of the plurality of dispensable coin storing units, and a plurality of driving means for driving the conveyor belts of the plurality of dispensable coin storing units independently of each other. According to the thus constituted coin receiving and dispensing machine, it is possible to improve the durability of the coin receiving and dispensing machine.

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## Description

### BACKGROUND OF THE INVENTION

The present invention relates to a coin receiving and dispensing machine and particularly to a table-type coin receiving and dispensing machine having excellent durability.

### DESCRIPTION OF THE PRIOR ART

Japanese Utility Model Application Laid Open No. 7-36266 proposes a coin receiving and dispensing machine which can use received coins for dispensation and in which a dispensable coin storing section for storing coins for dispensation in accordance with their denominations is inclined for decreasing the height of the coin receiving and dispensing machine to be suitable for a table-type one.

In this coin receiving and dispensing machine, the dispensable coin storing section includes a plurality of dispensable coin storing units for storing coins in accordance with their denominations. Each of the dispensable coin storing units is provided with a conveyor belt for conveying coins to the front side where a coin dispensing opening is formed and each of the conveyor belts is disposed so that the front end portion is located upward and driven by a common motor. In the vicinity of the front end portions of the conveyor belts of the respective dispensable coin storing units, a separation roller rotated in the reverse direction to the direction in which coins are fed out by the conveyor belts and driven by a common motor is provided for feeding coins one by one. An optical sensor for detecting coins passing through the separation roller is provided in the vicinity of the front end portion of each conveyor belt and a stop pin is further provided at the upstream portion of the optical sensor for projecting toward the conveyor belt so that the clearance between the upper surface of coin and itself is less than the thickness of the coin.

In the thus constituted coin receiving and dispensing machine, when coins stored in the dispensable coin storing section are dispensed, the separation roller is driven by the common motor and the conveyor belt of each dispensable coin storing unit is simultaneously driven by the common motor. Coins are separated one by one by the separation roller and fed out from each of the dispensable coin storing units and the number thereof is counted by the optical sensors. When one of the optical sensors detects that the number of coins fed out from the associated dispensable coin storing unit has reached the number of coins to be dispensed, the associated stop pin is projected to abut against the upper surface of the coin to be fed out last. When the coin to be fed out last and pressed by the stop pin has been fed out, the stop pin moves near the associated conveyor belt so that the clearance between the upper surface of the conveyor belt and itself is less than the

thickness of a coin, thereby preventing the following coin from being fed out from the associated dispensable coin storing unit. When a predetermined number of coins has been fed out from the each of dispensable coin storing units, the common motor is stopped and the conveyor belts are stopped.

In this coin receiving and dispensing machine, the conveyor belt of each dispensable coin storing unit always has to be driven until the coin to be fed out last and pressed by the stop pin has been fed out. Therefore, each of the conveyor belts tends to be worn due to frictional force produced between the coin stopped by the stop pin and itself and irregular load is inevitably applied to the motor for driving the conveyor belts. Therefore, the durability of the coin receiving and dispensing machine is low.

### SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a table-type coin receiving and dispensing machine having excellent durability.

The above and other objects of the present invention can be accomplished by a coin receiving and dispensing machine comprising a plurality of dispensable coin storing units for storing coins for dispensation in accordance with their denominations, each of the plurality of dispensable coin storing units including a conveyor belt inclined so that a feed-out end portion from which coins are fed out is disposed upward, at least one separation roller disposed above the conveyor belts in the vicinity of the feed-out end portions of the plurality of dispensable coin storing units so that a clearance between the conveyor belts and itself is a predetermined distance and rotatable in a direction reverse to a coin convey direction of the conveyor belts, at least one support plate for receiving coins from the feed-out end portions of the plurality of dispensable coin storing units and supporting them on an upper surface thereof, a plurality of dispensing rollers provided so as to correspond to the plurality of dispensable coin storing units, disposed above the at least one support plate so that clearances between the at least one support plate and themselves are predetermined distances and rotatable at higher speed than the coin convey speed of the conveyor belts in the coin convey direction of the conveyor belts, a plurality of sensors for detecting coins fed out from the feed-out end portions of the plurality of dispensable coin storing units, and a plurality of driving means for driving the conveyor belts of the plurality of dispensable coin storing units independently of each other.

In a preferred aspect of the present invention, the at least one separation roller and the plurality of dispensing rollers are driven by a single driving means.

In a further preferred aspect of the present invention, each of the conveyor belts is wound around at least two rollers, one of the at least two rollers is formed with a small diameter portion around which the conveyor belt

is not wound, the plurality of driving means are disposed inside of the plurality of conveyor belts wound around the at least two rollers and drive belts for transmitting driving forces of the driving means for driving the plurality of conveyor belts are wound around the small diameter portions.

In a further preferred aspect of the present invention, the coin receiving and dispensing machine further comprises a coin depositing opening through which coins can be deposited, a coin passage for transporting coins deposited through the coin depositing opening one by one, coin discriminating and counting means for discriminating whether or not coins are acceptable and the denominations of the acceptable coins and counting the coins, coin sorting means for sorting coins based on the result of the discrimination made by the coin discriminating and counting means, a coin temporary storing section for temporarily storing coins discriminated to be acceptable by the coin discriminating and counting means and sorted by the coin sorting means in accordance with their denominations, and a safe for collecting coins, the plurality of dispensable coin storing units being constituted to receive coins temporarily stored in the coin temporary storing section.

In a further preferred aspect of the present invention, the plurality of dispensable coin storing units are disposed below the coin temporary storing section and at a position where they can receive coins dropped from the coin temporary storing section.

The above and other objects and features of the present invention will become apparent from the following description made with reference to the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic perspective view of the appearance of a coin receiving and dispensing machine which is a preferred embodiment of the present invention.

Figure 2 is a schematic partial plan view of a driving mechanism for the shutter.

Figure 3 is a schematic plan view of a mechanism disposed below the upper cover for discriminating, counting and sorting coins deposited through the coin depositing opening in accordance with their denominations.

Figure 4 is a schematic plan view of a coin temporary storing section.

Figure 5 is a schematic left side view of the coin temporary storing section shown in Figure 4.

Figure 6 is a schematic left side view of the coin temporary storing section showing it releasing

coins on belt conveyors forwardly.

Figure 7 is a schematic left side view of a coin temporary storing section showing it releasing coins on belt conveyors rearwardly.

Figure 8 is a schematic plan view of a dispensable coin storing section and a safe section.

Figure 9 is a schematic right side view of the dispensable coin storing section.

Figure 10 is a schematic partial plan view of a drive mechanism for belt conveyors of dispensable coin storing units.

Figure 11 is a schematic right side view of a mechanism for preventing coins dropped onto belt conveyors from being held to erect at the rear and lower end portions of the belt conveyors.

Figure 12 is a schematic right side view of Figure 11.

Figure 13 is a schematic side view showing the shape of a cam.

Figure 14 is a schematic side view showing the shapes of a ratchet roller and a driven roller.

Figure 15 is a schematic perspective view of a safe.

Figure 16 is a schematic perspective view of a safe accommodating box positioned in front of a coin receiving and dispensing machine.

Figure 17 is a schematic plan view of a safe locking mechanism for locking a safe accommodating box.

Figure 18 is a schematic partial front view of a mechanism in the vicinity of a connecting member of the safe locking mechanism.

Figure 19 is a schematic partial front view of a mechanism in the vicinity of the rear end portion of a safe locking member.

Figure 20 is a schematic partial front view of a mechanism in the vicinity of the front end portion of a safe locking member.

Figure 21 is a schematic right side view of a safe accommodating box abutting against and locked on the front surface of a coin receiving and dispensing machine, shown together with a dispensable coin storing section.

Figure 22 is a schematic plan view of a shutter lock-

ing mechanism for locking a shutter for opening and closing a coin releasing opening of a chute to keep the coin releasing opening open and a receiving tray movement restricting mechanism for restricting the movement of a receiving tray inserted into a coin dispensing opening.

Figure 23 is a schematic left side view showing a mechanism in the vicinity of a coin releasing opening of a chute when a receiving tray is about to be set in a coin dispensing opening.

Figure 24 is a schematic left side view showing a mechanism in the vicinity of a coin releasing opening of a chute when a receiving tray has reached a predetermined position.

Figure 25 is a schematic plan view showing a shutter locking mechanism and a receiving tray movement restricting mechanism when a receiving tray has reached a predetermined position.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in Figure 1, a coin receiving and dispensing machine 1 is provided with a coin depositing opening 2 having an opening facing upwardly on the upper surface thereof and a shutter 3 is supported below the coin depositing opening 2 to be slidable in the fore-aft direction for opening and closing the coin depositing opening 2.

A display section 4 and an operating section 5 are formed on the front surface of the coin receiving and dispensing machine 1 and the display section 4 is constituted so as to display the results of counting deposited coins, instructions to the operator and the like. Further, the front surface of the coin receiving and dispensing machine 1 is formed with a coin returning opening 6 for returning coins discriminated to be unacceptable among the deposited coins and a key inserting section 7 into which a key can be inserted.

The lower portion on the front side of the coin receiving and dispensing machine 1 is formed with a coin dispensation opening 8 for dispensing coins. The coins are dispensed onto a receiving tray 9 inserted into the coin dispensation opening 8. At a lower portion on the front side of the coin receiving and dispensing machine 1, a dispensable coin storing section 10 comprising dispensable coin storing units (not shown) for storing coins in accordance with their denominations and a safe section 11 for accommodating a safe (not shown) for collecting coins which cannot be stored in the dispensable coin storing units and coins stored in the dispensable coin storing units. The coin storing section 10 and the safe section 11 are provided so that they can be drawn out. When the dispensable coin storing section 10 and the safe section 11 are pushed to prede-

termined positions, they are automatically locked and when the key is inserted into the key inserting section 7 to release the lock, they can be drawn out.

The upper portion of the coin receiving and dispensing machine 1 formed with the coin depositing opening 2, the shutter 3 and operating section 5 forms an upper cover 12 which is provided on the coin receiving and dispensing machine 1 so as to be swingable about an end edge 13 and the upper cover 12 can be opened by inserting the key into the key inserting section 7 and releasing the lock and is automatically locked when closed.

Figure 2 is a schematic partial plan view of a driving mechanism for the shutter 3.

As shown in Figure 2, a shutter unit 20 is mounted on the lower surface of the upper cover 12 and a slide shaft 21 extending in the longitudinal direction is fixed to the shutter unit 20. A shutter mounting member 22 is mounted on the slide shaft 21 to be slidable in the longitudinal direction.

The rear end portion of the shutter 3 is mounted on the shutter mounting member 22 and the front end portion of the shutter 3 is supported by a shutter guide 23 of the shutter unit 20. The shutter guide 23 comprises a frame portion 24 having substantially a rectangular shape whose center coincides with the center of the coin depositing opening 2, a hopper portion 25 inclined downwardly toward the inside portion of the frame portion 24 and a projecting portion 26 formed on the outer sides of the frame portion 24 on the right and left and front sides thereof and projecting upwardly from the frame portion 24. The frame portion 24 of the shutter guide 23 is disposed in such a manner that the clearance between itself and the lower surface of the upper cover 12 is equal to the thickness of the shutter 3 and the projecting portion 26 projects upwardly by a distance equal to the thickness of the shutter 3 and is adapted to support the outer portion of the shutter 3 when the coin depositing opening 2 is closed by the shutter 3.

Both edges of the front end portion of the shutter 3 are formed with convex portions 27 projecting forwardly and the projecting portion 26 of the shutter guide 23 is formed with concave portions 28 having complementary shapes to those of the convex portions 27 for receiving the convex portions 27 of the shutter 3 when the shutter 3 closes the coin depositing opening 2.

In the vicinity of the slide shaft 21 of the shutter mounting member 22, a rack member 30 is fixed along the slide shaft 21 and a drive gear 31 is provided so as to mesh with the rack member 30. When the drive gear 31 is driven by a shutter motor (not shown), the shutter 3 is moved along the slide shaft 21 in the longitudinal direction, thereby closing the coin depositing opening 2. A first sensor 32 and a second sensor 33 are provided on the body of the coin receiving and dispensing machine 1 and it is possible to judge whether the shutter 3 closes or opens the coin depositing opening 2

depending on which of the first sensor 32 and the second sensor detects a detection piece 34 formed on the shutter mounting member 22.

Figure 3 is a schematic plan view of a mechanism disposed below the upper cover 12 for discriminating, counting and sorting coins deposited through the coin depositing opening 2 in accordance with their denominations.

As shown in Figure 3, a mechanism for discriminating, counting and sorting coins deposited through the coin depositing opening 2 in accordance with their denominations is provided below the upper cover 12.

A rotatable disk 40 is provided below the coin depositing opening 2 for receiving coins deposited through the coin depositing opening 2 and feeding them out by a centrifugal force and a coin passage 41 extending along the front portion of the coin receiving and dispensing machine 1 communicates with the rotatable disk 40.

An annular guide (not shown) is provided about the circumference of the rotatable disk 40 and coins deposited onto the rotatable disk 40 are fed along the annular guide by the centrifugal force produced by the rotation of the rotatable disk 40 to a coin take-out opening 42 formed in the annular guide. Coins are separated and fed one by one into the coin passage 41 by a separating member (not shown) provided in the coin take-out opening 42. Each coin fed into the coin passage 41 is accelerated by a roller 43 disposed adjacent to the coin take-out opening 42 to be separated from the following coin and conveyed in the coin passage 41.

The coin passage 41 is formed between a pair of guide members 44, 45 and a transport belt 46 is provided so as to hold coins between the upper surface of the coin passage 41 and itself.

In the coin passage 41, a coin discriminating section 47 is provided for discriminating whether or not each coin is acceptable and the denomination of each acceptable coin and counting the number of acceptable coins. The coin discriminating section 47 comprises optical sensors for detecting the diameter, the surface pattern, the side surface pattern and the like of each coin, magnetic sensors for detecting magnetic properties of each coin, and the like. The results of discriminating coins are input into a control section (not shown) and the results of counting coins are displayed on the display section 4.

A first coin sorting passage 50 extending along the side portion of the coin receiving and dispensing machine 1 is connected to the downstream end of the coin passage 41 and the transport belt 46 extends from the coin passage 41 to the first coin sorting passage 50.

The first coin sorting passage 50 is provided with a first coin sorting section 51. The first coin sorting section 51 has a projecting member 52 and a sorting opening 53. The projecting member 52 is rotatable about a vertical axis and is formed with a flat wall portion 52a and a cylindrical wall portion 52b. When the flat wall por-

tion 52a is positioned to face the first coin sorting passage 51, the flat wall portion 52a is flush with a guide wall 54 of the first coin sorting passage 51 and, on the other hand, when the cylindrical wall portion 52a is positioned to face the first coin sorting passage 51, the cylindrical wall portion 52b projects from the guide wall 54 into the first coin sorting passage 51. Therefore, when the projecting member 52 is positioned in such a manner that the flat wall portion 52a faces the first coin sorting passage 51, a coin is further fed along downstream the guide wall 54 in the first coin sorting passage 51 and when the projecting member 52 is positioned in such a manner that the cylindrical wall portion 52b faces the first coin sorting passage 51, a coin is pushed away from the guide wall 54 by the projecting member 52. The projecting member 52 is constituted so as to be rotated via a link mechanism 56 by a solenoid 55.

The first coin sorting passage 50 is provided with a second coin sorting section 61 downstream of the first coin sorting section 51. The second coin sorting section 61 has the same structure as that of the first coin sorting section 51 and has a rotatable projecting member 62 and a sorting opening 63. The projecting member 62 is formed with a flat wall portion 62a and a cylindrical wall portion 62b and is constituted so as to be rotated via a link mechanism 66 by a solenoid 65.

Sensors 57 and 67 are respectively provided immediately upstream of the first coin sorting section 51 and the second coin sorting section 61.

When the sensor 57 detects a coin discriminated to be acceptable by the coin discriminating section 47, the projecting member 52 is positioned so that the flat wall portion 52a faces the first coin sorting passage 51, thereby allowing the acceptable coin to pass through the first coin sorting section 51 and, on the other hand, when the sensor 57 detects a coin discriminated to be unacceptable by the coin discriminating section 47, the projecting member 52 is rotated so that the cylindrical wall portion 52b faces the first coin sorting passage 51, thereby pushing the unacceptable coin away from the guide wall and dropping it into the sorting opening 53.

On the other hand, the second coin sorting section 61 is adapted to lead to a coin temporary storing section (not shown) coins which are acceptable but cannot be used for dispensation because the number of coins of the denomination stored in the coin receiving and dispensing machine 1 is too great. As described in detail later, the coin receiving and dispensing machine 1 according to this embodiment has a coin temporary storing section (not shown) comprising coin temporary storing units for storing coins to be dispensed in accordance with their denominations and a collected coin temporary storing unit for storing coins to be collected into a safe and a dispensable coin storing section 10 comprising dispensable coin storing units for receiving coins from the coin temporary storing units of the coin temporary storing section and storing them for dispensation in accordance with their denominations. Coins are fed into

the coin temporary storing units via coin sorting openings described later. Therefore, when the number of coins capable of being stored in a dispensable coin storing unit for storing coins of a specific denomination decreases to less than a predetermined number, if a coin of the denomination is fed into the coin temporary storing unit in which coins of the denomination are to be stored, there is a risk of the coin not being stored in the coin temporary storing unit. Therefore, the second coin sorting section 61 is constituted so as to feed only coins of the denomination at risk into the collected coin temporary storing unit of the coin temporary storing section and to store the coins therein, thereby collecting them into a safe (not shown).

A second coin sorting passage 70 extending along the rear portion of the coin receiving and dispensing machine 1 is connected to the downstream portion of the first coin sorting passage 50. The transport belt 46 extends from the coin passage 41 through the first coin sorting passage 50 and terminates at the upstream portion of the second coin sorting passage 70.

The second coin sorting passage 70 is formed with coin sorting openings 71a, 71b, 71c, 71d, 71e and 71f and a transport belt 72 for transporting coins is provided in the second coin sorting passage 70 so as to hold coins between the upper surface of the second coin sorting passage 70 and itself. The coin sorting openings 71a, 71b, 71c, 71d, 71e and 71f are formed so that the diameter of one located upstream is smaller than that of one located downstream.

Sensors 73a, 73b, 73c, 73d, 73e and 73f are respectively provided immediately upstream of the coin sorting openings 71a, 71b, 71c, 71d, 71e and 71f.

The coin sorting openings 71a, 71b, 71c, 71d, 71e and 71f are adapted to store coins in the coin temporary storing units of the coin temporary storing section described next in accordance with their denominations.

Figure 4 is a schematic plan view of the coin temporary storing section and Figure 5 is a schematic left side view of the coin temporary storing section shown in Figure 4.

The coin temporary storing section 80 is disposed immediately below the coin discriminating, counting and sorting mechanism shown in Figure 3 and is adapted to temporarily store coins dropped through the sorting opening 63 of the second coin sorting section 61 and the coin sorting openings 71a, 71b, 71c, 71d, 71e and 71f of the second coin sorting passage 70. As shown in Figure 4, the coin temporary storing section 80 is provided with a collected coin temporary storing unit 81 and coin temporary storing units 81a, 81b, 81c, 81d, 81e and 81f. The collected coin temporary storing unit 81 is adapted to temporarily store coins dropped through the sorting opening 63 of the second coin sorting section 61. Coins temporarily stored in the collected coin temporary storing unit 81 are collected into a safe when a coin receipt instruction signal is input through the operating section, while they are returned onto the

receiving tray 9 set below the coin releasing opening via a chute described later when a coin receipt stop signal is input. The coin temporary storing units 81a, 81b, 81c, 81d, 81e and 81f are adapted to temporarily store coins dropped through the coin sorting openings 71a, 71b, 71c, 71d, 71e and 71f of the second coin sorting passage 70 in accordance with their denominations. As described later, coins temporarily stored in the coin temporary storing units 81a, 81b, 81c, 81d, 81e and 81f are fed into dispensable coin storing units of a dispensable coin storing section for storing coins to be dispensed and stored therein in accordance with their denominations, when a coin receipt instruction signal is input through the operating section 5 and, when a coin receipt stop signal is input, the coins are returned onto the receiving tray 9 set below a coin releasing opening via a chute and the coin releasing opening described later.

As shown in Figures 4 and 5, the coin temporary storing units 81a, 81b, 81c, 81d, 81e and 81f extend horizontally and are respectively provided with belt conveyors 82a, 82b, 82c, 82d, 82e and 82f and adjacent coin temporary storing units 81a, 81b, 81c, 81d, 81e, 81f are separated by a separation members 79.

The belt conveyors 82a, 82b, 82c, 82d, 82e and 82f are constituted so as to be driven in forward and backward directions by a single motor (not shown).

As shown in Figure 5, the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f are integrally mounted on a belt conveyor unit 83 and the belt conveyor unit 83 is supported by a support shaft 85 extending in a widthwise direction through a center portion of a pair of unit side plates 84, 84. A swing drive shaft 86 extending in a widthwise direction is mounted on a rear and upper portion of the unit side plates 84, 84 and a cam 87 is fixed to the swing drive shaft 86. The cam 87 and one end portion of the belt conveyor unit 83 are connected by a link 88 so that when the cam 87 is rotated, the link 88 is moved upwardly and downwardly, thereby swinging the belt conveyor unit 83 about the support shaft 85.

As shown in Figures 4 and 5, above the front end portions of the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f of the coin temporary storing units 81a, 81b, 81c, 81d, 81e and 81f, a gate member 89 is provided and above the rear end portions thereof, a gate member 90 is provided. These gate members 89, 90 are intended to prevent coins dropped onto the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f of the coin temporary storing units 81a, 81b, 81c, 81d, 81e and 81f through the sorting opening 63 and the coin sorting openings 71a, 71b, 71c, 71d, 71e and 71f from being dropped from the front end portions and the rear end portions of the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f. The gate member 89 is fixed to a support shaft 91 rotatably mounted on the unit side plates 84 and the gate member 90 is fixed to a support shaft 92 rotatably mounted on the unit side plates 84.

A support shaft 93 extending in the widthwise direction is supported by the unit side plates 84, 84 above the

support shaft 85 supporting the belt conveyor unit 83 and a cam 94 is swingably supported by the support shaft 93. The upper portion of the cam 94 and the upper portion of the cam 87 are connected by a link 95. A link 96 is connected to the front portion of the cam 94 and a link 97 is connected to the rear portion of the cam 94. The other end portion of the link 96 is connected to one end portion of a link 99 whose other end portion is connected to the support shaft 92. Therefore, when the cam 87 is swung, the cam 94 is swung and, as a result, the links 96 and 97 rotate the support shafts 91 and 92 via the links 98 and 99 to swing the gate members 89 and 90, thereby selectively moving the gate members 89, 90 apart from the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f.

Figure 6 is a schematic left side view of the coin temporary storing section 80 showing it releasing coins on the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f forwardly. Coins are deposited in the coin receiving and dispensing machine 1 according to this embodiment through the coin depositing opening 2 and stored in the coin temporary storing section 80. However, if the operator inputs a coin receipt stop signal through the operating section 5 after the counted value of the deposited coins counted by the coin discriminating section 47 was displayed on the display section 4, the coins stored in the coin temporary storing section 80 are fed to a chute and returned to a coin releasing opening. For enabling such an operation, a chute (not shown) is provided below the front end portion of the coin temporary storing section 80 so as to communicate with a coin releasing opening (not shown).

As shown in Figure 6, when the swing drive shaft 86 is rotated clockwise, the cam 87 is rotated clockwise and the link 88 is moved upwardly so that the front end portion of the belt conveyor unit 83 is inclined downwardly. At the same time, the cam 94 is rotated clockwise and the support shaft 91 is rotated counterclockwise via the links 96 and 98, whereby the gate member 89 disposed on the front side is moved apart from the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f. Therefore, it is possible to release coins on the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f forwardly. The coins forwardly released from the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f are returned onto the receiving tray 9 set below a coin releasing opening via a chute and a coin releasing opening described later.

Figure 7 is a schematic left side view of the coin temporary storing section 80 showing it releasing coins on the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f rearwardly. The coin receiving and dispensing machine 1 according to this embodiment is constituted so that if the operator inputs a coin receipt instruction signal through the operating section 5 after the counted value of the deposited coins counted by the coin discriminating section 47 was displayed on the display section 4, coins stored in the coin temporary storing section 80 are

fed to the dispensable coin storing section 10 disposed below the rear end portion of the coin temporary storing section 80. For enabling such an operation, the dispensable coin storing section 10 having dispensable coin storing units for storing coins in accordance with their denominations is provided below the rear end portion of the coin temporary storing section 80.

As shown in Figure 7, when the swing drive shaft 86 is rotated counterclockwise, the cam 87 is rotated counterclockwise and the link 88 is moved downwardly so that the rear end portion of the belt conveyor unit 83 is inclined downwardly. At the same time, the cam 94 is rotated counterclockwise and the support shaft 92 is rotated clockwise via the links 97 and 99, whereby the gate member 90 disposed on the rear side is moved apart from the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f. Therefore, it is possible to release coins on the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f rearwardly. The coins rearwardly released from the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f are fed into the dispensable coin storing units of the dispensable coin storing section 10 in accordance with their denominations and stored therein.

In Figures 4 to 7, the reference numeral 100 designates a sensor for detecting coins dropped through the sorting opening 63 and the coin sorting openings 71a, 71b, 71c, 71d, 71e and 71f. The sensor 100 comprises a light emitting element and a light receiving element and the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f are moved forwardly when light emitted from the light emitting element is intercepted by a coin dropped through the sorting opening 63 and the coin sorting openings 71a, 71b, 71c, 71d, 71e and 71f. In Figure 4, the reference numeral 101 designates a chute for leading unacceptable coins dropped through the sorting opening 53 of the first coin sorting section 51 to the coin returning opening 6.

Figure 8 is a schematic plan view of the dispensable coin storing section 10 and the safe section 11 and Figure 9 is a schematic right side view of the dispensable coin storing section 10.

As shown in Figure 8, the dispensable coin storing section 10 comprises dispensable coin storing units 10a, 10b, 10c, 10d, 10e and 10f for storing coins to be dispensed in accordance with their denominations. The dispensable coin storing units 10a, 10b, 10c, 10d, 10e and 10f are respectively associated with the coin temporary storing units 81a, 81b, 81c, 81d, 81e and 81f and located at positions where coins dropped from the rear end portions of the belt conveyors 82a, 82b, 82c, 82d, 82e and 82f of the coin temporary storing units 81a, 81b, 81c, 81d, 81e and 81f can be received therein.

To the contrary, coins temporarily stored in the collected coin temporary storing unit 81 and dropped from the rear end portions of the belt conveyor 82 are collected into a safe 110 via a chute 105.

The dispensable coin storing units 10a, 10b, 10c, 10d, 10e and 10f extend in the longitudinal direction and



are disposed in such a manner that the rear end portions thereof are inclined downwardly. The dispensable coin storing units 10a, 10b, 10c, 10d, 10e and 10f respectively include belt conveyors 111a, 111b, 111c, 111d, 111e and 111f and the adjacent belt conveyors 111a, 111b, 111c, 111d, 111e, 111f are separated by a separation members 108. The belt conveyors 111a, 111b, 111c, 111d, 111e and 111f are independently driven by independent motors (not shown). The belt conveyors 111a, 111b, 111c, 111d, 111e and 111f are respectively provided with rear walls 112a, 112b, 112c, 112d, 112e and 112f extending rearwardly and upwardly at the rear end portions thereof. The coin temporary storing units 81a, 81b, 81c, 81d, 81e and 81f of the coin temporary storing section 80 are disposed substantially above the base portions of the rear walls 112a, 112b, 112c, 112d, 112e and 112f and the surfaces of the rear walls 112a, 112b, 112c, 112d, 112e and 112f on the side of the belt conveyors 111a, 111b, 111c, 111d, 111e and 111f are formed to be concave and cylindrical in such a manner that the cylindrical surface has an axis extending upwardly.

A reverse rotating roller 113 rotating in the opposite direction to the transport direction of the belt conveyors 111a, 111b, 111c, 111d, 111e and 111f is provided above the front end portions of the belt conveyors 111a, 111b, 111c, 111d, 111e and 111f and the clearance between the front end portions of the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f and the reverse rotating roller 113 is set equal to or greater than the average thickness of coins to be handled and equal to or less than double the average thickness, preferably, 1.5 times the average thickness.

As shown in Figure 9, in front of the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f, a support plate 114 is provided for supporting coins fed out from the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f so as to be located on the extension of the upper surface of the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f and dispensing rollers 115a, 115b, 115c, 115d, 115e and 115f which can be rotated at higher circumference speed than the coin transport speed of the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f are provided at positions above and opposite to the support plate 114. The clearances between the support plate 114 and the respective dispensing rollers 115a, 115b, 115c, 115d, 115e, 115f are set smaller than the thickness of a coin of corresponding denomination, preferably, about half of the thickness of a coin of corresponding denomination. As shown in Figure 8, the reverse rotating roller 113 and the dispensing rollers 115a, 115b, 115c, 115d, 115e, 115f are rotated by a single common motor (not shown) via a drive belt 109.

As shown in Figure 9, sensors 116a, 116b, 116c, 116d, 116e, 116f each including a light emitting element and a light receiving element are provided for detecting coins passing through the portion between the reverse rotating roller 113 and the dispensing rollers 115a,

115b, 115c, 115d, 115e, 115f and sensors 117a, 117b, 117c, 117d, 117e, 117f each including a light emitting element and a light receiving element are further provided in front of the respective dispensing rollers 115a, 115b, 115c, 115d, 115e, 115f.

As shown in Figures 8 and 9, a tube-like chute 118 is provided for leading coins downwardly in front of the support plate 114 and the dispensing rollers 115a, 115b, 115c, 115d, 115e, 115f and a coin releasing opening 119 is formed for releasing coins onto the receiving tray 9 at the lower end portion of the chute 118. The chute 118 is disposed below the front end portions of the collected coin temporary storing unit 81 and the coin temporary storing units 81a, 81b, 81c, 81d, 81e, 81f of the coin temporary storing section 80 and coins dropped from the front end portions of the collected coin temporary storing unit 81 and the coin temporary storing unit 81a, 81b, 81c, 81d, 81e, 81f can be led via the chute 118 and the coin releasing opening 119 onto the receiving tray 9 set below the coin releasing opening 119. Further, a shutter 120 is provided for closing the coin releasing opening 119 when the receiving tray 9 is not set below the coin releasing opening 119. The shutter 120 is always biased by a spring (not shown) so as to close the coin releasing opening 119 and when the receiving tray is set below the coin releasing opening 119 and an abutment portion 120a of the shutter 120 is pushed rearwardly by the receiving tray 9, the shutter 120 opens the coin releasing opening 119.

A shaft 121 extending in the widthwise direction is supported by the chute 118 and a collection chute 122 is supported by the shaft 121 for collecting coins stored in the dispensable coin storing units 10a, 10b, 10c, 10d, 10e and 10f into the safe 110. The collection chute 122 is swingable about the shaft 121 between its retracted position indicated by a solid line in Figure 9 where it is spaced apart from the support plate 114 and the dispensing rollers 115a, 115b, 115c, 115d, 115e, 115f and its facing position indicated by a broken line in Figure 9 where it is located close to and to face the support plate 114 and the dispensing rollers 115a, 115b, 115c, 115d, 115e, 115f and is always biased toward its retracted position so that the wall portion thereof forms a wall portion of the chute 118. The collection chute 122 has a coin receiving opening 122a which faces the support plate 114 and the dispensing rollers 115a, 115b, 115c, 115d, 115e, 115f and can receive coins when the collection chute 122 is located at its facing position. It also has a coin feed-out opening 122b for feeding out coins. At the completion of business, coins stored in the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f can be collected into the safe 110 by positioning the safe 110 in front of the coin receiving and dispensing machine 1, feeding coins into the collection chute 122 positioned at its facing position via the coin receiving opening 122a and feeding coins into the safe 110 via the coin feed-out opening 122b.

Coins stored in the thus constituted dispensable



coin storing units 10a, 10b, 10c, 10d, 10e, 10f of the dispensable coin storing section 10 are dispensed onto the receiving tray 9 via the coin releasing opening 119 in the following manner.

The receiving tray 9 is first set below the coin releasing opening 119 and the reverse rotating roller 113 and the dispensing rollers 115a, 115b, 115c, 115d, 115e, 115f are driven by a motor (not shown).

One of the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f corresponding to coins of the denomination to be dispensed is then driven and coins on the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f are conveyed forwardly toward the reverse rotating roller 113. When coins stacked on the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f reach the reverse rotating roller 113, coins except the lowermost coin are sent back on the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f by the reverse rotating roller 113 and only the lowermost coin is fed toward the support plate 114. Therefore, coins are fed from the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f onto the support plate 114 one by one. Coins fed onto the support plate 114 are detected by one of the sensors 116a, 116b, 116c, 116d, 116e, 116f and the number thereof is counted.

Each of the coins fed onto the support plate 114 one by one is accelerated by the dispensing rollers 115a, 115b, 115c, 115d, 115e, 115f and fed into the chute 118 to fall within the chute so that it is dispensed onto the receiving tray 9 via the coin releasing opening 119. At this time, the coin is detected by one of the sensors 117a, 117b, 117c, 117d, 117e, 117f and counted.

When the one of the sensors 116a, 116b, 116c, 116d, 116e, 116f has detected coins in the number predetermined in advance, the belt conveyor 111a, 111b, 111c, 111d, 111e, 111f corresponding to coins of the denomination is stopped. In the case where coins of two or more denominations are to be dispensed, a next belt conveyor 111a, 111b, 111c, 111d, 111e, 111f corresponding to coins of another denomination is driven, whereby coins of the denomination are dispensed onto the receiving tray 9 via the coin releasing opening 119 in the same manner.

When the predetermined numbers of coins of the respective denominations have been dispensed, the reverse rotating roller 113 and the dispensing rollers 115a, 115b, 115c, 115d, 115e, 115f are stopped, thereby completing the coin dispensing operation.

Figure 10 is a schematic partial plan view of a drive mechanism for the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f of the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f.

As shown in Figure 10, each of rollers 130a, 130b, 130c, 130d, 130e, 130f around which an associated one of the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f is wound at the front portion of the coin receiving and dispensing machine 1 is divided into two large diameter portions 131a, 131b, 131c, 131d, 131e, 131f and a small diameter portion 132a, 132b, 132c, 132d,

132e, 132f between the two large diameter portions 131a, 131b, 131c, 131d, 131e, 131f. The belt conveyors 111a, 111b, 111c, 111d, 111e, 111f are respectively supported by the two large diameter portions 131a, 131b, 131c, 131d, 131e, 131f and drive belts 133a, 133b, 133c, 133d, 133e, 133f are wound around the small diameter portion 132a, 132b, 132c, 132d, 132e, 132f. Each of the drive belts 133a, 133b, 133c, 133d, 133e, 133f is also wound around a drive roller 136a, 136b, 136c, 136d, 136e or 136f fixed to an output shaft 135a, 135b, 135c, 135d, 135e or 135f of a motor 134a, 134b, 134c, 134d, 134e or 134f and the driving force of the motor 134a, 134b, 134c, 134d, 134e or 134f is transmitted to the associated belt conveyor 111a, 111b, 111c, 111d, 111e or 111f via the output shaft 135a, 135b, 135c, 135d, 135e or 135f, the drive roller 136a, 136b, 136c, 136d, 136e or 136f and the drive belt 133a, 133b, 133c, 133d, 133e or 133f. The motors 134a, 134b, 134c, 134d, 134e and 134f can be driven independently of each other.

As shown in Figure 9, the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f are further wound around rollers 137a, 137b, 137c, 137d, 137e, 137f and rollers 138a, 138b, 138c, 138d, 138e, 138f (only the roller 138a is shown) and the motors 134a, 134b, 134c, 134d, 134e, 134f are disposed inside of the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f in a staggered arrangement as shown in Figure 10.

Figure 11 is a schematic right side view of a mechanism for preventing coins dropped onto the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f from being held erect at the rear and lower end portions of the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f and Figure 12 is a schematic right side view of Figure 11.

As shown in Figures 11 and 12, a support shaft 140 is fixed to the body of the coin receiving and dispensing machine 1 behind the rollers 137a, 137b, 137c, 137d, 137e, 137f and cams 141a, 141b, 141c, 141d, 141e, 141f and end portions of torsion springs 142a, 142b, 142c, 142d, 142e, 142f are fixed to the support shaft 140. As shown in Figure 13, each of the cams 141a, 141b, 141c, 141d, 141e, 141f includes a flat cut portion 143a, 143b, 143c, 143d, 143e, 143f and a circle portion 144a, 144b, 144c, 144d, 144e, 144f. Further, ratchet rollers 145a, 145b, 145c, 145d, 145e, 145f are rotatably mounted on the support shaft 140 and driven rollers 146a, 146b, 146c, 146d, 146e, 146f, which are integrally formed with the ratchet rollers 145a, 145b, 145c, 145d, 145e, 145f, are in friction contact with the circumferences of the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f wound around the rollers 137a, 137b, 137c, 137d, 137e, 137f and are rotated in accordance with the movement of the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f. As shown in Figure 14, the ratchet rollers 145a, 145b, 145c, 145d, 145e, 145f are further formed with cut portions 147a, 147b, 147c, 147d, 147e, 147f engageable with end portions of the torsion springs 142a, 142b, 142c, 142d, 142e, 142f.

The torsion springs 142a, 142b, 142c, 142d, 142e, 142f extend upwardly and the rear end portions of projecting members 150a, 150b, 150c, 150d, 150e, 150f projectable into the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f through openings 148a, 148b, 148c, 148d, 148e, 148f formed in the rear walls 112a, 112b, 112c, 112d, 112e, 112f are connected to the upper end portions of the torsion springs 142a, 142b, 142c, 142d, 142e, 142f.

Therefore, when the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f are moved, the driven rollers 146a, 146b, 146c, 146d, 146e, 146f in friction contact therewith are rotated, thereby rotating the ratchet rollers 145a, 145b, 145c, 145d, 145e, 145f. As a result, when the cut portions 147a, 147b, 147c, 147d, 147e, 147f formed in the ratchet rollers 145a, 145b, 145c, 145d, 145e, 145f reach the cut portions 143a, 143b, 143c, 143d, 143e, 143f of the cams 141a, 141b, 141c, 141d, 141e, 141f, the cut portions 147a, 147b, 147c, 147d, 147e, 147f engage with the end portions of the torsion springs 142a, 142b, 142c, 142d, 142e, 142f located at positions indicated by solid lines in Figure 11, thereby swinging the torsion springs 142a, 142b, 142c, 142d, 142e, 142f clockwise in Figure 11 so as to move the projecting members 150a, 150b, 150c, 150d, 150e, 150f projecting into the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f through the openings 148a, 148b, 148c, 148d, 148e, 148f formed in the rear walls 112a, 112b, 112c, 112d, 112e, 112f rearwardly to positions indicated by broken lines in Figure 11.

When the projecting members 150a, 150b, 150c, 150d, 150e, 150f are moved to the positions indicated by the broken lines in Figure 11, the cut portions 147a, 147b, 147c, 147d, 147e, 147f formed in the ratchet rollers 145a, 145b, 145c, 145d, 145e, 145f reach the circle portion 144a, 144b, 144c, 144d, 144e, 144f of the cams 141a, 141b, 141c, 141d, 141e, 141f, thereby releasing the engagement between the cut portions 147a, 147b, 147c, 147d, 147e, 147f formed in the ratchet rollers 145a, 145b, 145c, 145d, 145e, 145f and the end portions of the torsion springs 142a, 142b, 142c, 142d, 142e, 142f so that the torsion springs 142a, 142b, 142c, 142d, 142e, 142f return to positions indicated by the solid lines in Figure 11 by their own biasing force. As a result, the projecting members 150a, 150b, 150c, 150d, 150e, 150f project into the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f through the openings 148a, 148b, 148c, 148d, 148e, 148f formed in the rear walls 112a, 112b, 112c, 112d, 112e, 112f.

Therefore, even in the case where coins dropped from the coin temporary storing units 81a, 81b, 81c, 81d, 81e, 81f of the coin temporary storing section 80 onto the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f of the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f stand erect along the rear walls 112a, 112b, 112c, 112d, 112e, 112f, it is possible push the coins over to lie flat on the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f. Since, as described above, the

surfaces of the rear walls 112a, 112b, 112c, 112d, 112e and 112f on the side of the belt conveyors 111a, 111b, 111c, 111d, 111e and 111f are formed to be concave and cylindrical in such a manner that the cylindrical surface has an axis extending upwardly in this embodiment, coins pushed over lie along the concave and cylindrical surfaces of the rear walls 112a, 112b, 112c, 112d, 112e and 112f at substantially the center portions of the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f.

Figure 15 is a schematic perspective view of the safe 110.

The safe 110 is adapted to collect coins fed from the second coin sorting section 61 of the first coin sorting passage 50 into the collected coin temporary storing unit 81 of the coin temporary storing section 80 and temporarily stored therein and coins stored in the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f in accordance with their denominations at the completion of business and is shaped to be substantially rectangular parallelepiped.

When coins temporarily stored in the collected coin temporary storing unit 81 of the coin temporary storing section 80 are to be collected into the safe 110, the belt conveyor unit 83 is swung rearwardly about the support shaft 85 to open the gate member 90 so that coins on the belt conveyor 82 fall in the chute 105 and are accommodated in the safe 110 through a substantially rectangular coin receiving opening 155 formed on the upper surface of the safe 110.

The safe section 11 comprises a safe accommodating box 160 which can be drawn to the front side of the coin receiving and dispensing machine 1 and the safe 110 is detachably accommodated in the safe accommodating box 160 from the upper side.

As shown in Figure 8, a shaft 161 extending in the longitudinal direction of the coin receiving and dispensing machine 1 is fixed to the right side of the coin receiving and dispensing machine 1 and a support member 162 is slidably mounted on the shaft 161. A support shaft 163 is mounted on the support member 162 and the safe accommodating box 160 is swingably supported by the support shaft 163. Therefore, the safe accommodating box 160 can be drawn along the shaft 161 to the front side of the coin receiving and dispensing machine 1 and can be positioned in front of the coin receiving and dispensing machine 1 by swinging it about the support shaft 163.

The coin receiving opening 155 formed on the upper surface of the safe 110 is normally closed by a shutter 165 and only when the safe accommodating box 160 accommodating the safe 110 is located at a predetermined position in the safe section 11 where the safe 110 can receive coins, the lock of the shutter 165 by a lock mechanism (not shown) is released and the coin receiving opening 155 is opened.

A spring (not shown) is provided on the upper surface of the bottom of the safe 110 to be positioned on

the rear side when the safe accommodating box 160 accommodating the safe 110 is located at the predetermined position in the safe section 11 and the safe 110 is provided with a swingable bottom plate (not shown) on the spring. Thus, coins dropped through the coin receiving opening 155 into the safe 110 can be prevented from remaining at the rear portion of the safe 110 and as the number of coins stored in the safe 110 increases, the bottom plate is lowered against the spring force of the spring due to the weight of stored coins, whereby the required number of coins can be accommodated in the safe 110. In Figure 15, the reference numeral 166 designates a handle provided on the front surface of the safe accommodating box 160.

When business has been completed and coins stored in the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f are to be collected into the safe 110, the safe accommodating box 160 is positioned in front of the coin receiving and dispensing machine 1.

Figure 16 is a schematic perspective view showing the safe accommodating box 160 positioned in front of the coin receiving and dispensing machine 1.

When coins stored in the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f are to be collected into the safe 110, the safe accommodating box 160 is drawn along the shaft 161 to a predetermined position on the front side of the coin receiving and dispensing machine 1 and then swung along the support shaft 163 until it abuts against the front surface of the coin receiving and dispensing machine 1. When a sensor (not shown) detects that the safe accommodating box 160 has come into abutment with the front surface of the coin receiving and dispensing machine 1, the safe accommodating box 160 is locked.

Figure 17 is a schematic plan view of a safe locking mechanism for locking the safe accommodating box 160.

As shown in Figure 17, the safe locking mechanism includes a solenoid 170 provided on a dispensing opening cover 168 forming the coin dispensing opening 8 and a slide member 171 fixed to the solenoid 170 and movable in the widthwise direction. A support shaft 172 is provided at the left end portion of the slide member 171 in Figure 17 and one end portion of a connecting member 174 swingably supported by a support shaft 173 extending in the longitudinal direction is connected to the support shaft 172. The slide member 171 is biased by a spring (not shown) to the right in Figure 17. A safe locking member 175 is swingably mounted on the front end portion of the support shaft 173. A sensor 176 is provided on the front surface of the coin receiving and dispensing machine 1 in the vicinity of the front end portion of the safe locking member 175.

On the other hand, the side surface of the safe accommodating box 160 to abut against the coin receiving and dispensing machine 1 is formed with detection piece 180 and a lock pin 181 projecting from the side surface, and the upper surface of the lock pin 181 is

formed with a groove 182.

Figure 18 is a schematic partial front view of a mechanism in the vicinity of the connecting member 174 of the safe locking mechanism, Figure 19 is a schematic partial front view of a mechanism in the vicinity of the rear end portion of the safe locking member 175 and Figure 20 is a schematic partial front view of a mechanism in the vicinity of the front end portion of the safe locking member 175.

When the safe accommodating box 160 is brought into abutment against the front surface of the coin receiving and dispensing machine 1 in order to be locked, the sensor 176 detects the detection piece 180 provided on the safe accommodating box 160, whereby it is confirmed that the safe accommodating box 160 has come into abutment with the front surface of the coin receiving and dispensing machine 1. The solenoid 170 is then driven. When the solenoid 170 is driven, the slide member 171 is moved against the force of the spring to the left in Figure 17 and the connecting member 174 is swung about the support shaft 173 clockwise in Figure 18. As a result, the safe locking member 175 mounted on the support shaft 173 is swung clockwise in Figure 20 and comes into engagement with the groove 182 formed on the upper surface of the lock pin 181 provided on the side surface of the safe accommodating box 160. It is detected by a sensor 177 provided on the dispensing opening cover 168 for detecting the rear end portion of the safe locking member 175 that the safe locking member 175 and the groove 182 of the lock pin 181 have engaged with each other.

Figure 21 is a schematic right side view of the safe accommodating box 160 abutting against and locked on the front surface of the coin receiving and dispensing machine 1, together with the dispensable coin storing section 10.

When the safe accommodating box 160 is locked on the front surface of the coin receiving and dispensing machine 1, the safe 110 is pressed downwardly by a press member 178 and can be prevented from being taken out from the safe accommodating box 160.

When business has been completed, the collection chute 122 is located at its facing position where it is located close to and faces the support plate 114 and the dispensing rollers 115a, 115b, 115c, 115d, 115e, 115f and the respective belt conveyors 111a, 111b, 111c, 111d, 111e, 111f are simultaneously driven so that coins stored in the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f are fed into the collecting chute 122 via the coin receiving opening 122a, whereby the coins are fed into the safe 110 via the coin feed-out opening 122b.

When all coins stored in the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f have been fed into the safe 110, the solenoid 170 is deenergized and the slide plate 171 is moved by the spring (not shown) to the right in Figure 17. As a result, the engagement between the safe locking member 175 and the groove 182 of the

lock pin 181 is released and the safe accommodating box 160 can be moved apart from the front surface of the coin receiving and dispensing machine 1. Therefore, the safe accommodating box 160 is swung about the support shaft 163 and the safe 110 can be taken out from the safe accommodating box 160.

Figure 22 is a schematic plan view of a shutter locking mechanism for locking the shutter 120 for opening and closing the coin releasing opening 119 of the chute 118 to keep the coin releasing opening 119 open and a receiving tray movement restricting mechanism for restricting the movement of the receiving tray 9 inserted into the coin dispensing opening 8.

As shown in Figure 22, the dispensing opening cover 168 is formed with a cut portion 190 forming the coin dispensing opening 8 at substantially the center portion of the front side of the coin receiving and dispensing machine 1 and substantially the central portion of the dispensing opening cover 168 is formed with a slide guide 191. The slide guide 191 is formed with two slots (not shown) extending in the longitudinal direction and having lengths equal to the stroke of the shutter 120 for opening and closing the coin releasing opening 119 of the chute 118 and guide pins 193, 194 of a mounting member 192 are respectively inserted into the two slots. The shutter 120 for opening and closing the coin releasing opening 119 of the chute 118 is fixed to substantially the center portion of the mounting member 192.

In the vicinity of the front end portion of the slide guide 191, a pulley 195 rotatable about a widthwise axis is provided. A spring 196 whose one end portion is fixed to the slide guide 191 is wound around the pulley 195 and the other end portion of the spring 196 is fixed to the guide pin 193 of the mounting member 192 so that the mounting member 192 and, therefore, the shutter 120 is constantly biased to the front side.

Figure 23 is a schematic left side view showing a mechanism in the vicinity of the coin releasing opening 119 of the chute 118, showing the receiving tray 9 in the process of being set in the coin dispensing opening 8.

As shown in Figure 23, a shaft 197 extending in the widthwise direction is provided in the mounting member 192. As shown in Figure 22, the shutter 120 is formed with a pair of slots 198 and a restricting member 200 biased upwardly by a spring 199 is swingably supported by the shaft 197. In Figure 23, the reference numeral 201 designates a press member for abutting against the restricting member 200 and swinging it about the shaft 197 as the receiving tray 9 is inserted into the coin dispensing opening 8.

As shown in Figure 22, a locking piece 211 is provided on the upper surface of the dispensing opening cover 168 so as to be swingable about a support shaft 210. The right end portion of the slide member 171 biased to the right in Figure 22 by the spring (not shown) is connected to the rear end portion of the locking piece 211. In Figure 23, the reference numeral 215 designates a cut portion formed in the mounting member 192

and engageable with the locking piece 211.

Figure 24 is a schematic left side view showing a mechanism in the vicinity of the coin releasing opening 119 of the chute 118 when the receiving tray 9 has reached a predetermined position and Figure 25 is a schematic plan view showing the shutter locking mechanism and the receiving tray movement restricting mechanism when the receiving tray 9 has reached the predetermined position.

When an instruction signal requesting dispensation of coins is input through the operating section 5 after the receiving tray 9 has been inserted and reached the predetermined position, the thus constituted shutter locking mechanism and receiving tray movement restricting mechanism locks the shutter 120 to keep the coin releasing opening open and holds the receiving tray 9 at a predetermined position in the following manner.

The solenoid 170 is first driven and the slide member 171 is moved against the force of the spring (not shown) to the left in Figure 22. As a result, the locking member 211 is swung about the support shaft 210 counterclockwise in Figure 25 and engages with the cut portion 215 of the mounting member 192 pushed rearwardly by the receiving tray 9, thereby locking the shutter 120 to keep the coin releasing opening 119 of the chute 118 open.

On the other hand, as the receiving tray 9 is inserted into the coin dispensing opening 8, the restricting member 200 is pressed by the press member 201 to be swung about the shaft 197 counterclockwise in Figures 23 and 24. When the receiving tray 9 has reached the position shown in Figure 24 and the shutter 120 is locked, one end portion of the restricting member 200 is positioned below the upper edge portion of the receiving tray 9. Therefore, the receiving tray 9 is prevented from being drawn out from the coin dispensing opening 8.

Thus, when all coins to be dispensed have been dispensed onto the receiving tray 9, the solenoid 170 is deenergized and the slide member 171 is moved by the force of the spring (not shown) to the right in Figures 22 and 25, thereby releasing the engagement between the locking member 211 and the cut portion 215 of the mounting member 192. As a result, when the receiving tray 9 is drawn from the coin dispensing opening 8, the shutter 120 is moved by the spring 196 so as to close the coin releasing opening 119, whereby the restricting member 200 is swung about the shaft 197 clockwise in Figures 23 and 24. Therefore, the receiving tray 9 can be drawn from the coin dispensing opening 8 without being restricted by the restricting member 200.

According to the above described embodiment, the belt conveyors 111a, 111b, 111c, 111d, 111e, 111f of the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f for storing coins for dispensation are driven by the motors 134a, 134b, 134c, 134d, 134e, 134f which are driven independently of each other and coins are separated one by one by the reverse rotating rollers 134

and fed onto the support plate 114. When each of the sensors 116a, 116b, 116c, 116d, 116e and 116f detects that a predetermined number of coins to be dispensed from the associated dispensable coin storing unit 10a, 10b, 10c, 10d, 10e or 10f has been fed out, the associated motor 134a, 134b, 134c, 134d, 134e or 134f for driving the belt conveyor 111a, 111b, 111c, 111d, 111e or 111f of the dispensable coin storing unit 10a, 10b, 10c, 10d, 10e or 10f is stopped, whereby a predetermined number of coins can be dispensed from each of the dispensable coin storing units 10a, 10b, 10c, 10d, 10e and 10f. Therefore, when a predetermined number of coins has been dispensed from each of the dispensable coin storing units 10a, 10b, 10c, 10d, 10e and 10f, no pressing force acts on the belt conveyors 111a, 111b, 111c, 111d, 111e and 111f and no irregular load is applied to the motors 134a, 134b, 134c, 134d, 134e, 134f. The durability of the coin receiving and dispensing machine 1 can therefore be remarkably improved. Moreover, coins stored in the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f can be collected into the safe 110 via the collection chute 122 by drawing the safe accommodating box 160 from the coin receiving and dispensing machine 1 and positioning it in front of the coin receiving and dispensing machine 1 and coins stored in the coin temporary storing units 81a, 81b, 81c, 81d, 81e, 81f can be fed into the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f by merely dropping them. Therefore, all coins can be collected into the safe 110 when business has been completed without providing any special transport mechanism. Further, according to the above described embodiment, when the number of coins which any of the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f can store becomes less than a predetermined number, the second coin sorting section 61 feeds coins of the denomination to be stored in the dispensable coin storing unit 10a, 10b, 10c, 10d, 10e or 10f to the collected coin temporary storing unit 81 of the coin temporary storing section 81 to be collected by the safe 110. Therefore, even in the case where the coin storing capacity of the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f is small, the coin storing capacity thereof can be efficiently utilized to use received coins for dispensation.

The present invention has thus been shown and described with reference to specific embodiments. However, it should be noted that the present invention is in no way limited to the details of the described arrangements but changes and modifications may be made without departing from the scope of the appended claims.

For example, in the above described embodiment, although the chute 118 and the collection chute 122 are separately provided, if a gate member is provided in the chute 118 or the collection chute 122 to selectively feed coins to the coin releasing opening 119 or coin feed-out opening 122b, it is not absolutely necessary to provide both the chute 118 and the collection chute 122 and a

single chute suffices.

Further, in the above described embodiment, the first coin sorting section 51 for returning unacceptable coins to the coin returning opening 6 and the second coin sorting section 61 for selectively feeding acceptable coins to the collected coin temporary storing unit 81 of the coin temporary storing section 80 are provided. However, if a mechanism is provided in the first coin sorting section 51 or the second coin sorting section 61 for selectively feeding unacceptable coins to the coin returning opening 6 and acceptable coins to the collected coin temporary storing unit 81 of the coin temporary storing section 80, it is possible to omit one of the first coin sorting section 51 and the second coin sorting section 61.

Furthermore, in the above described embodiment, although only a single reverse rotating roller 113 is provided, one reverse rotating roller may be provided for each of the dispensable coin storing units 10a, 10b, 10c, 10d, 10e and 10f. Further, one reverse rotating roller may be provided for each group consisting of a plurality of the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f.

Moreover, in the above described embodiment, although only a single support plate 114 is provided, one support plate may be provided for each of the dispensable coin storing units 10a, 10b, 10c, 10d, 10e and 10f. Further, one support plate may be provided for each group consisting of a plurality of the dispensable coin storing units 10a, 10b, 10c, 10d, 10e, 10f.

According to the present invention, it is possible to provide a table-type coin receiving and dispensing machine having excellent durability.

### Claims

1. A coin receiving and dispensing machine comprising a plurality of dispensable coin storing units for storing coins for dispensation in accordance with their denominations, each of the plurality of dispensable coin storing units including a conveyor belt inclined so that a feed-out end portion from which coins are fed out is disposed upward, at least one separation roller disposed above the conveyor belts in the vicinity of the feed-out end portions of the plurality of dispensable coin storing units so that a clearance between the conveyor belts and itself is a predetermined distance and rotatable in a direction reverse to a coin convey direction of the conveyor belts, at least one support plate for receiving coins from the feed-out end portions of the plurality of dispensable coin storing units and supporting them on an upper surface thereof, a plurality of dispensing rollers provided so as to correspond to the plurality of dispensable coin storing units, disposed above the at least one support plate so that clearances between the at least one support plate and themselves are predetermined distances and rotatable

at higher speed than the coin convey speed of the conveyor belts in the coin convey direction of the conveyor belts, a plurality of sensors for detecting coins fed out from the feed-out end portions of the plurality of dispensable coin storing units, and a plurality of driving means for driving the conveyor belts of the plurality of dispensable coin storing units independently of each other. 5

2. A coin receiving and dispensing machine in accordance with Claim 1 wherein the at least one separation roller and the plurality of dispensing rollers are driven by a single driving means. 10
3. A coin receiving and dispensing machine in accordance with Claim 1 or 2 wherein each of the conveyor belts is wound around at least two rollers, one of the at least two rollers is formed with a small diameter portion around which the conveyor belt is not wound, the plurality of driving means are disposed inside of the plurality of conveyor belts wound around the at least two rollers and drive belts for transmitting driving forces of the driving means for driving the plurality of conveyor belts are wound around the small diameter portions. 15 20 25
4. A coin receiving and dispensing machine in accordance with any one of Claims 1 to 3 which further comprises a coin depositing opening through which coins can be deposited, a coin passage for transporting coins deposited through the coin depositing opening one by one, coin discriminating and counting means for discriminating whether or not coins are acceptable and the denominations of the acceptable coins and counting the coins, coin sorting means for sorting coins based on the result of the discrimination made by the coin discriminating and counting means, a coin temporary storing section for temporarily storing coins discriminated to be acceptable by the coin discriminating and counting means and sorted by the coin sorting means in accordance with their denominations, and a safe for collecting coins, the plurality of dispensable coin storing units being constituted to receive coins temporarily stored in the coin temporary storing section. 30 35 40 45
5. A coin receiving and dispensing machine in accordance with Claim 4 wherein the plurality of dispensable coin storing units are disposed below the coin temporary storing section and at a position where they can receive coins dropped from the coin temporary storing section. 50

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FIG. 1

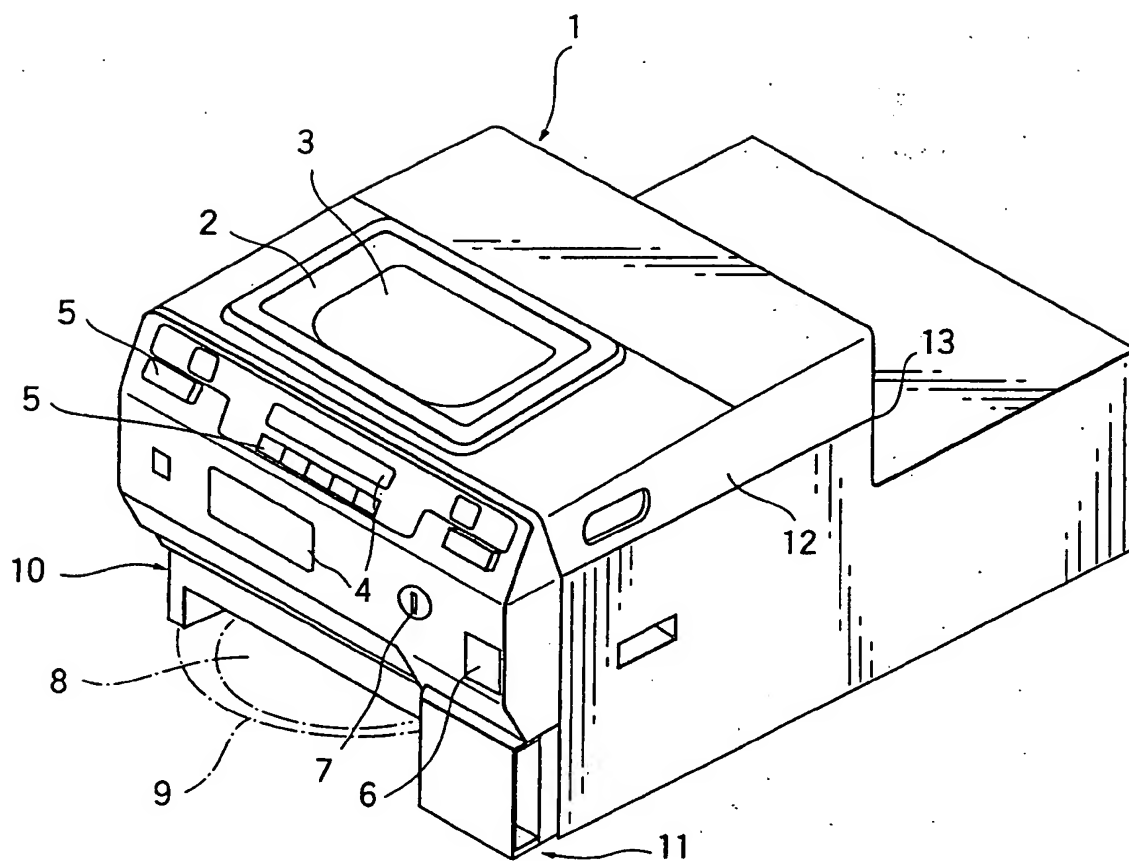




FIG. 2

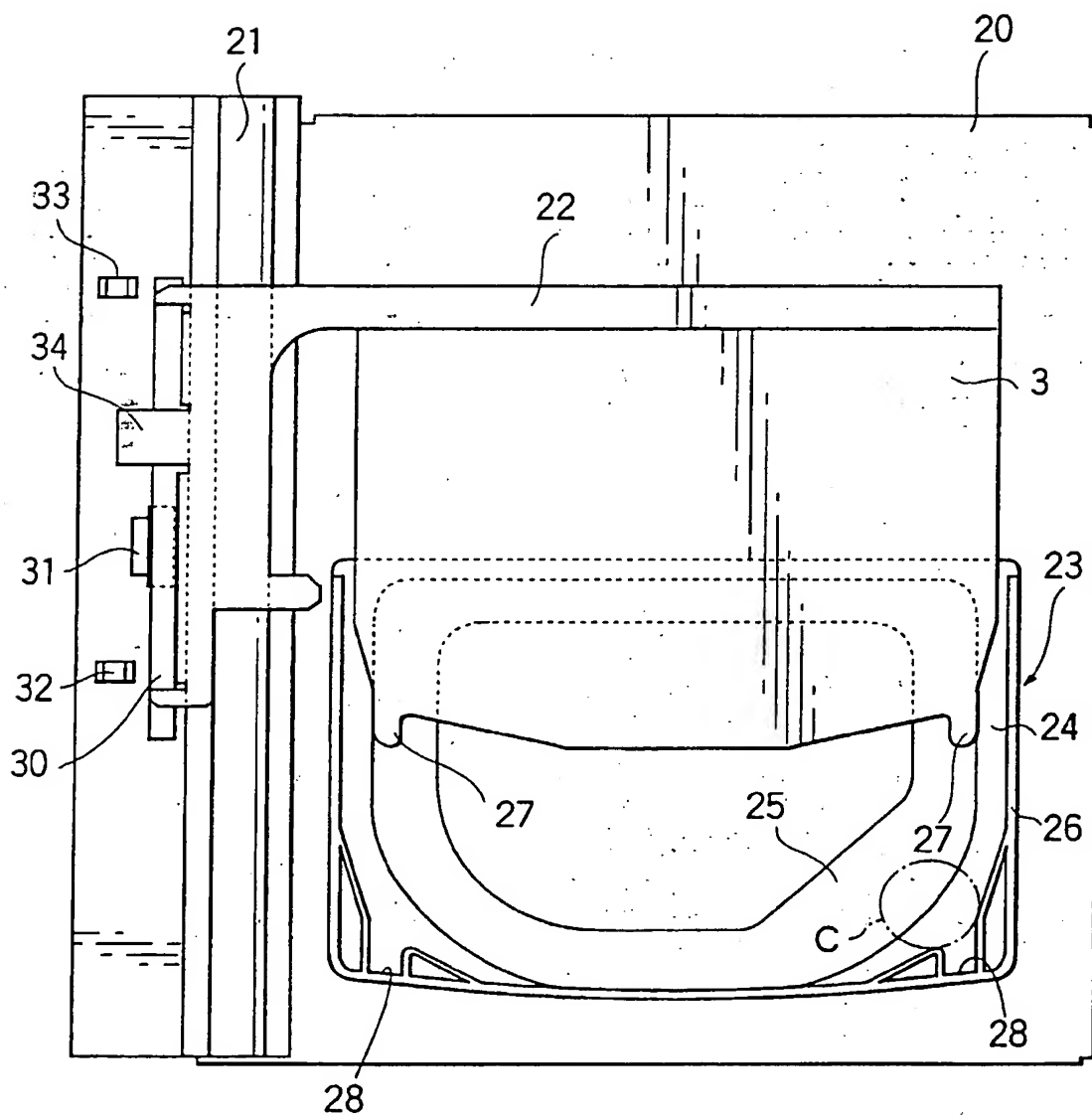




FIG. 4

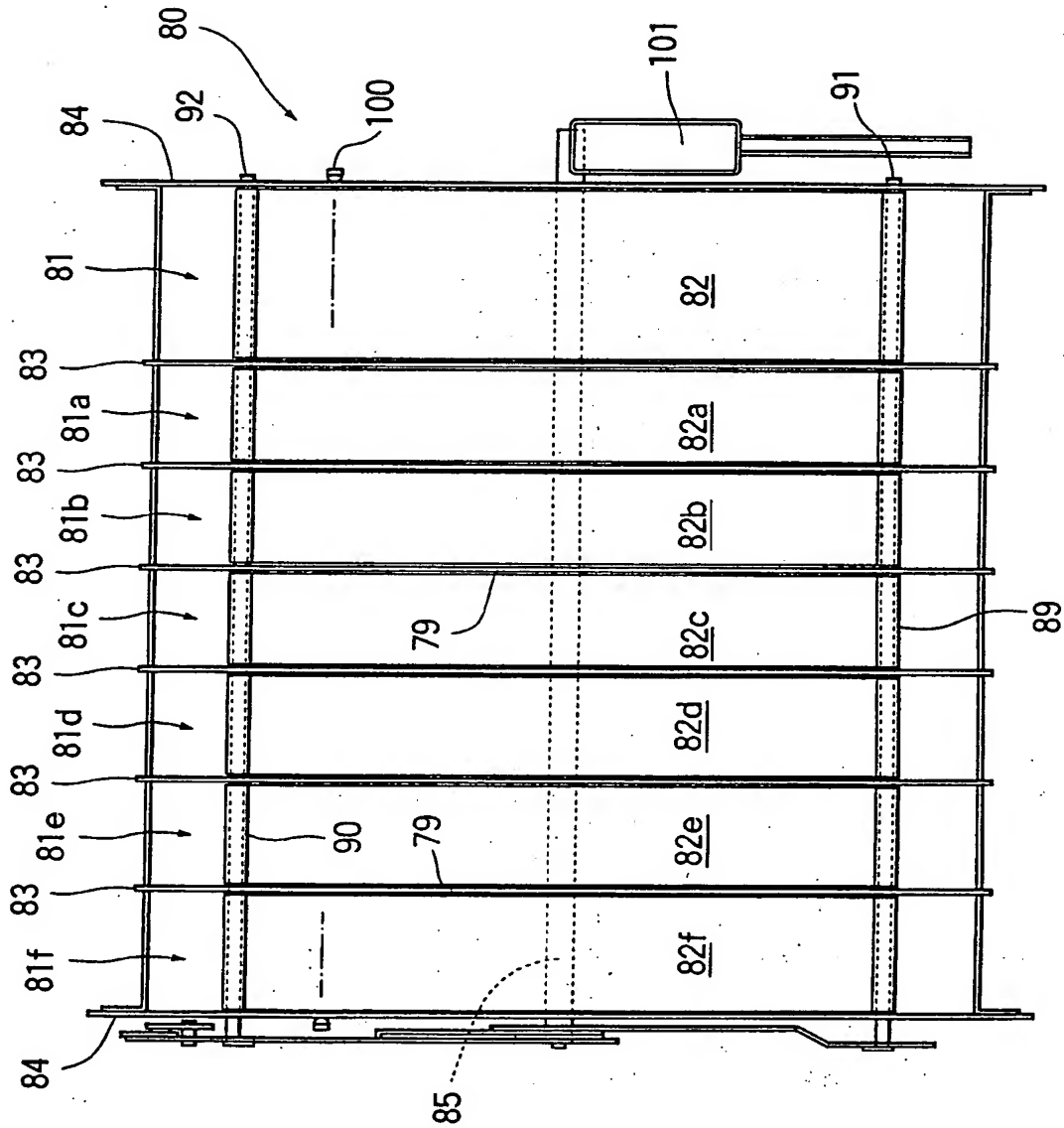


FIG. 5

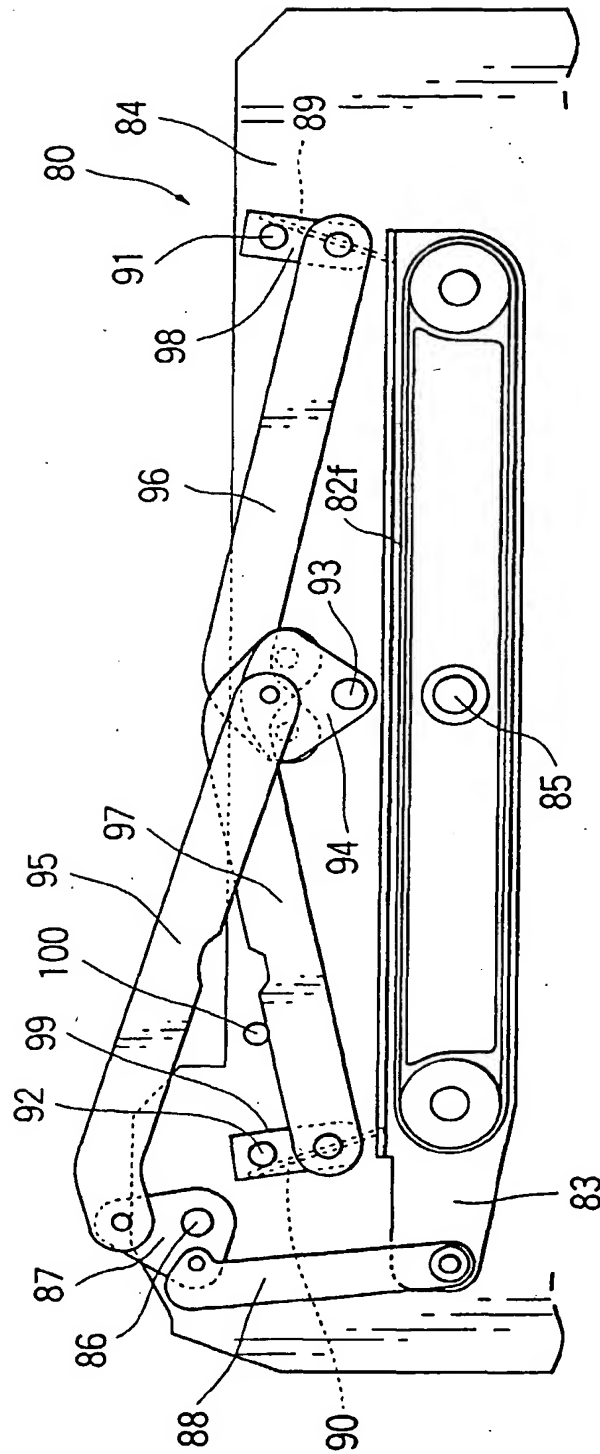


FIG. 6

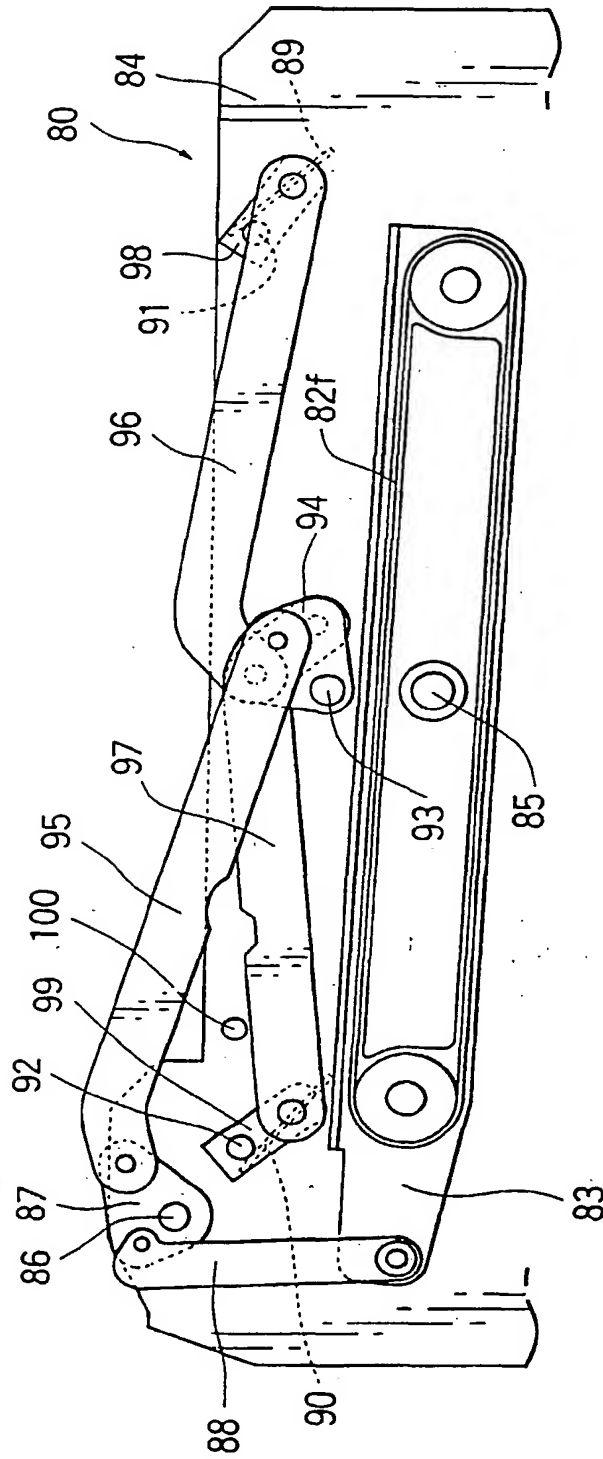


FIG. 7

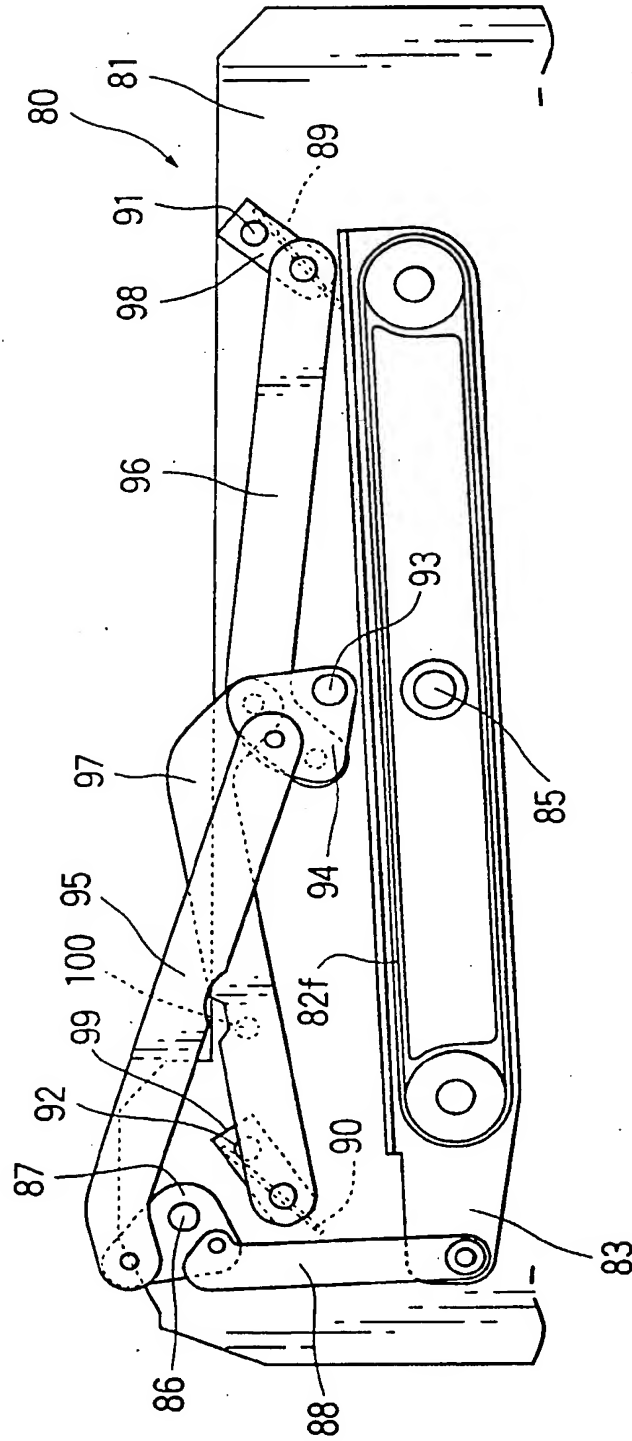






FIG. 9

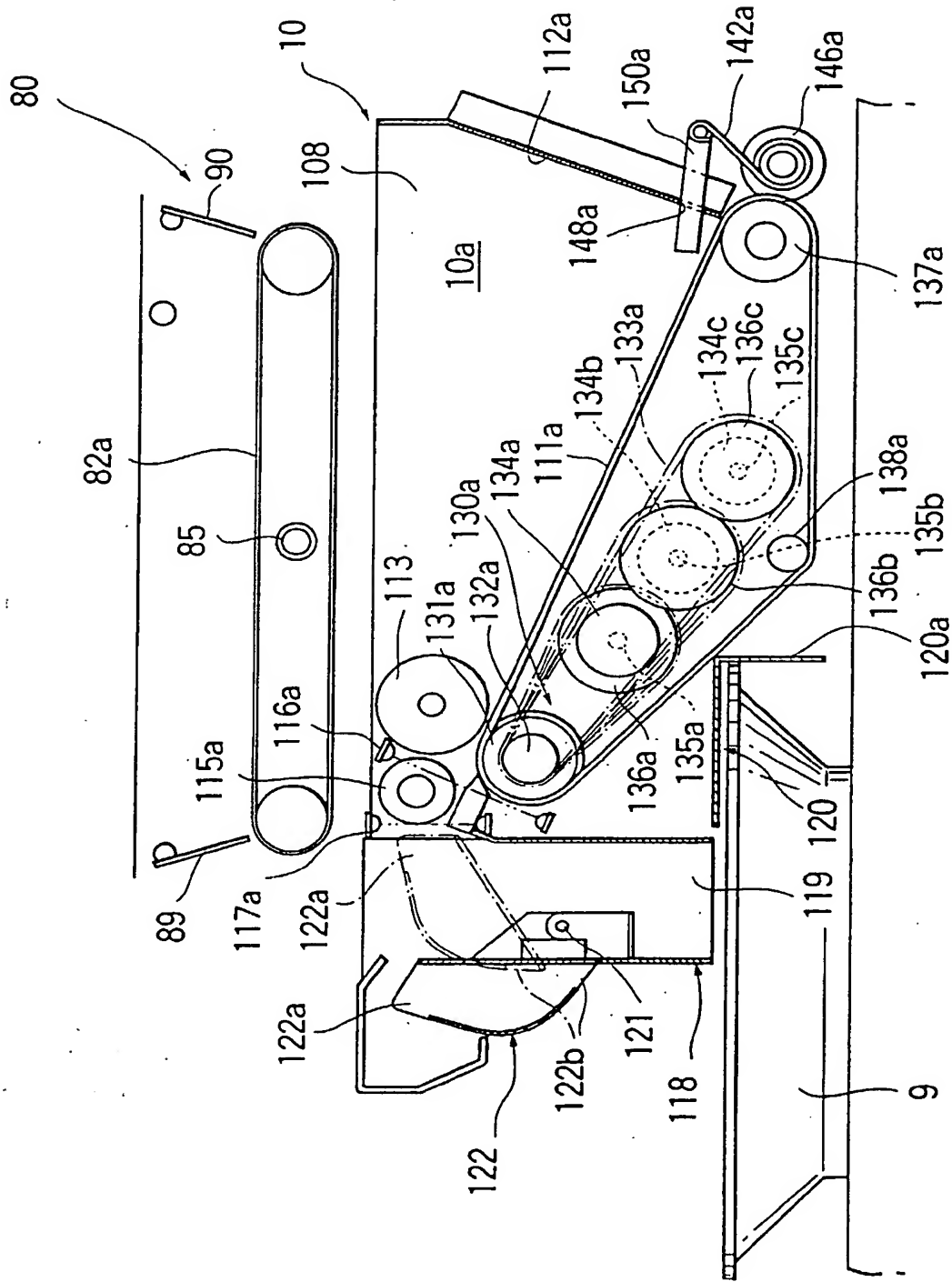


FIG. 10

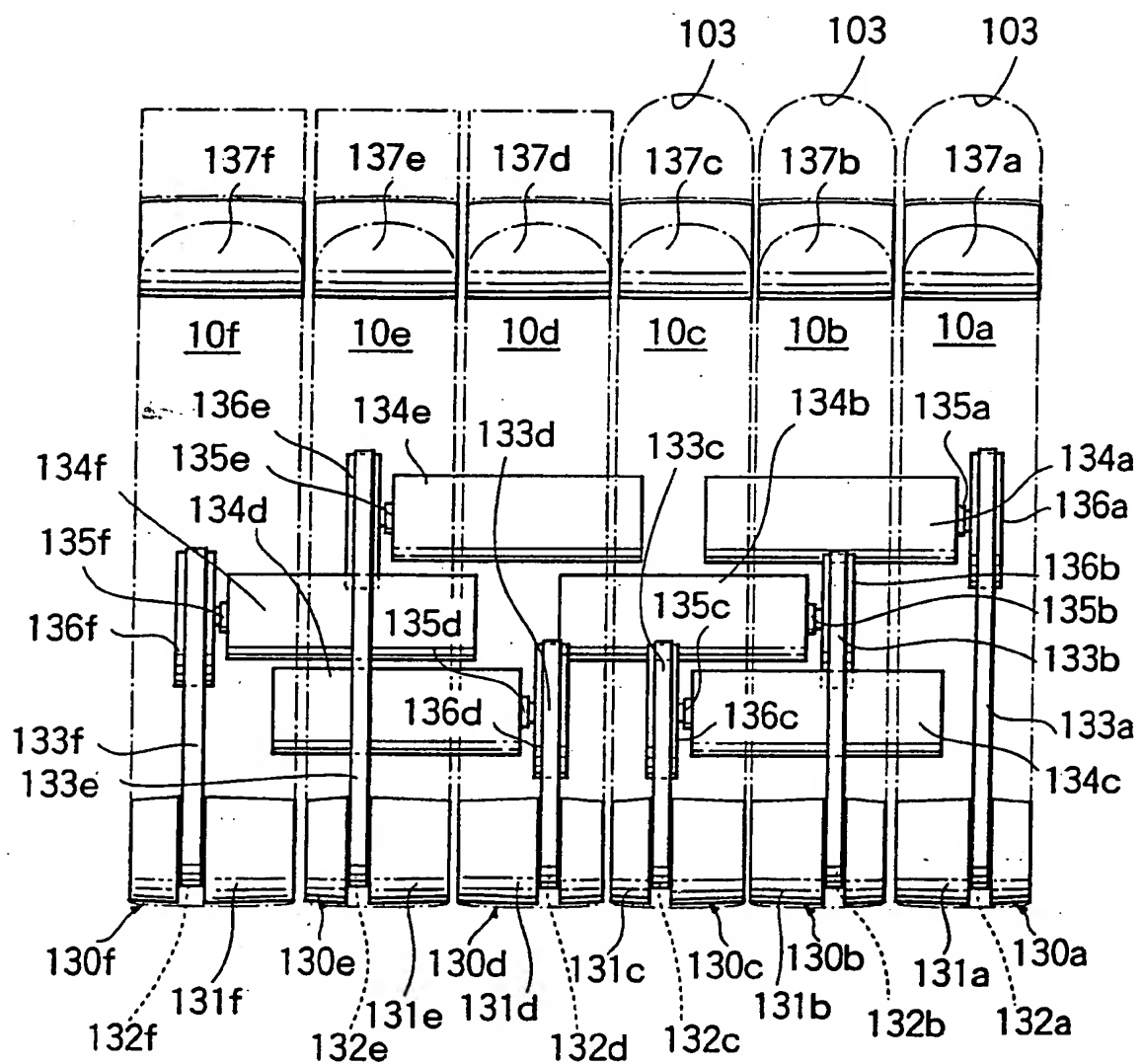


FIG. 11

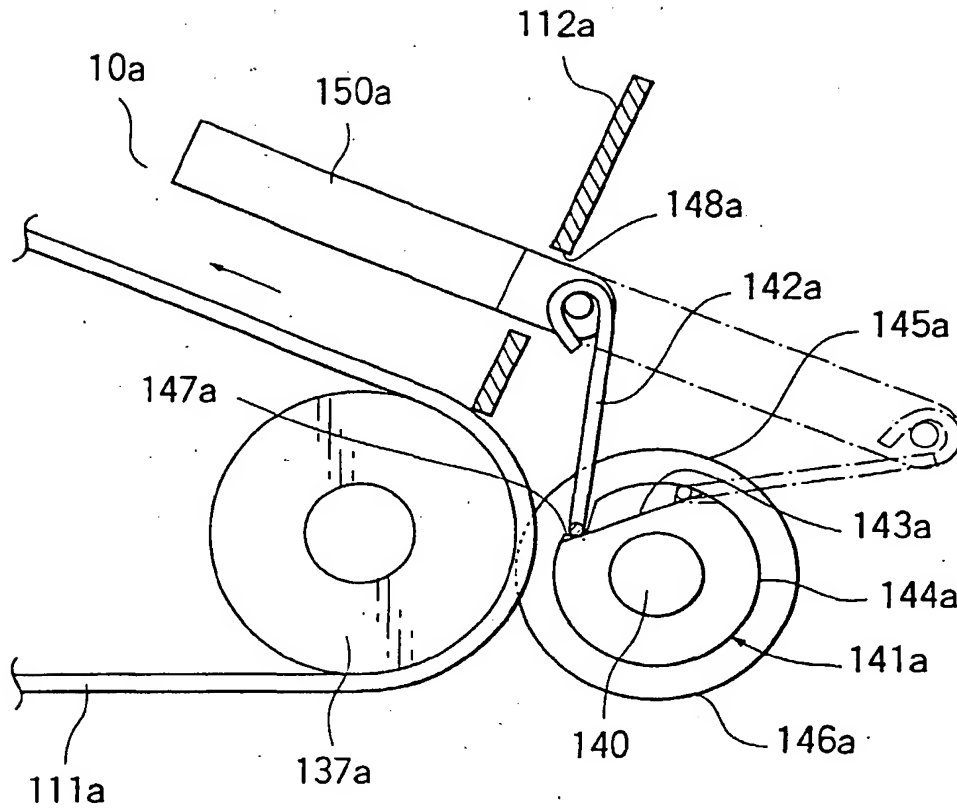


FIG. 12

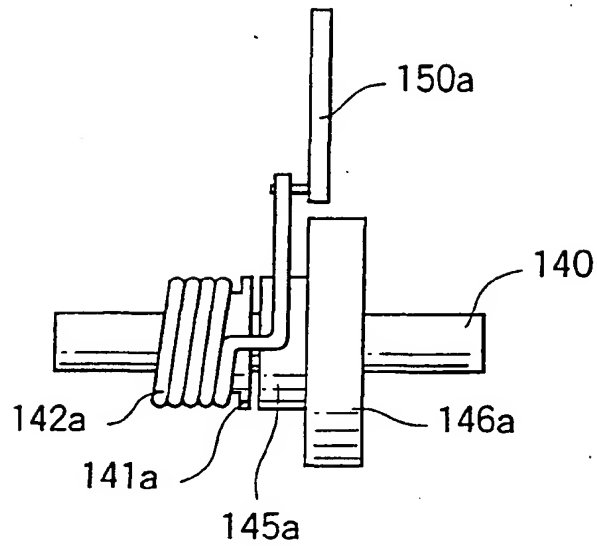


FIG. 13

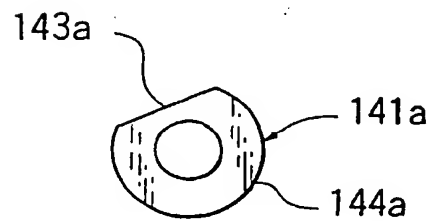


FIG. 14

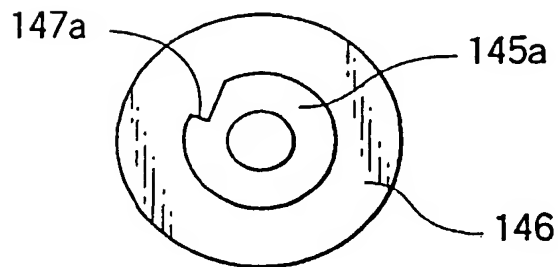


FIG. 15

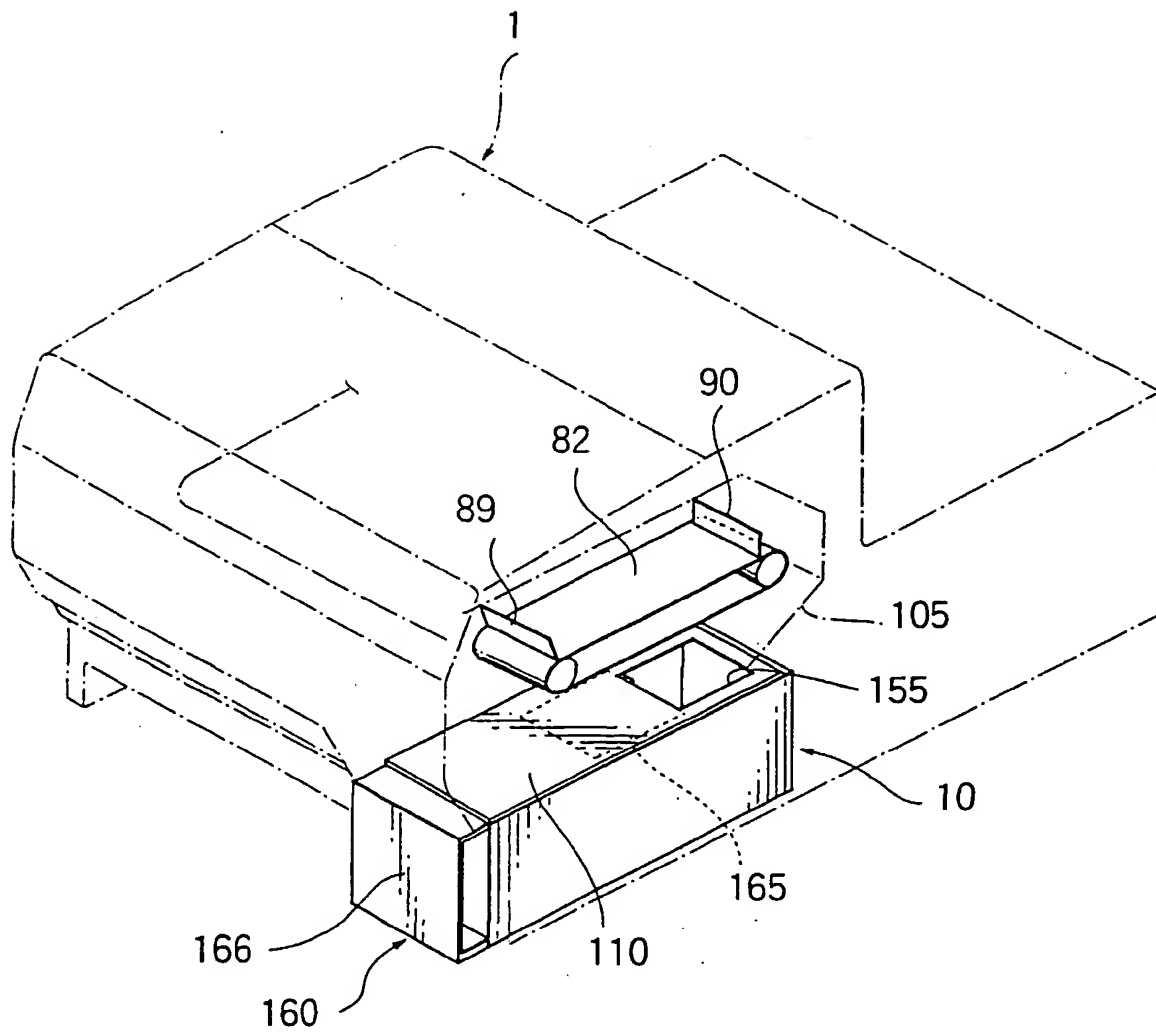


FIG. 16

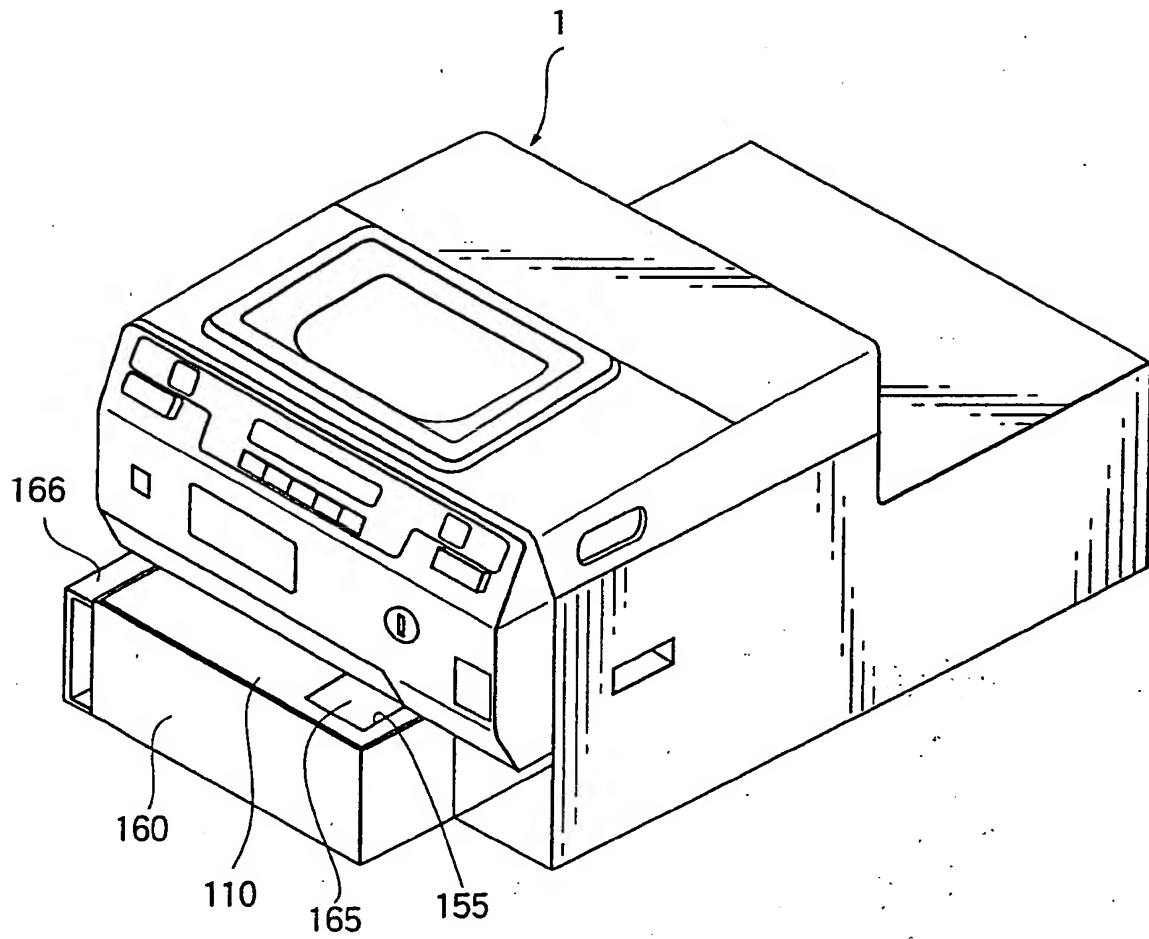


FIG. 17

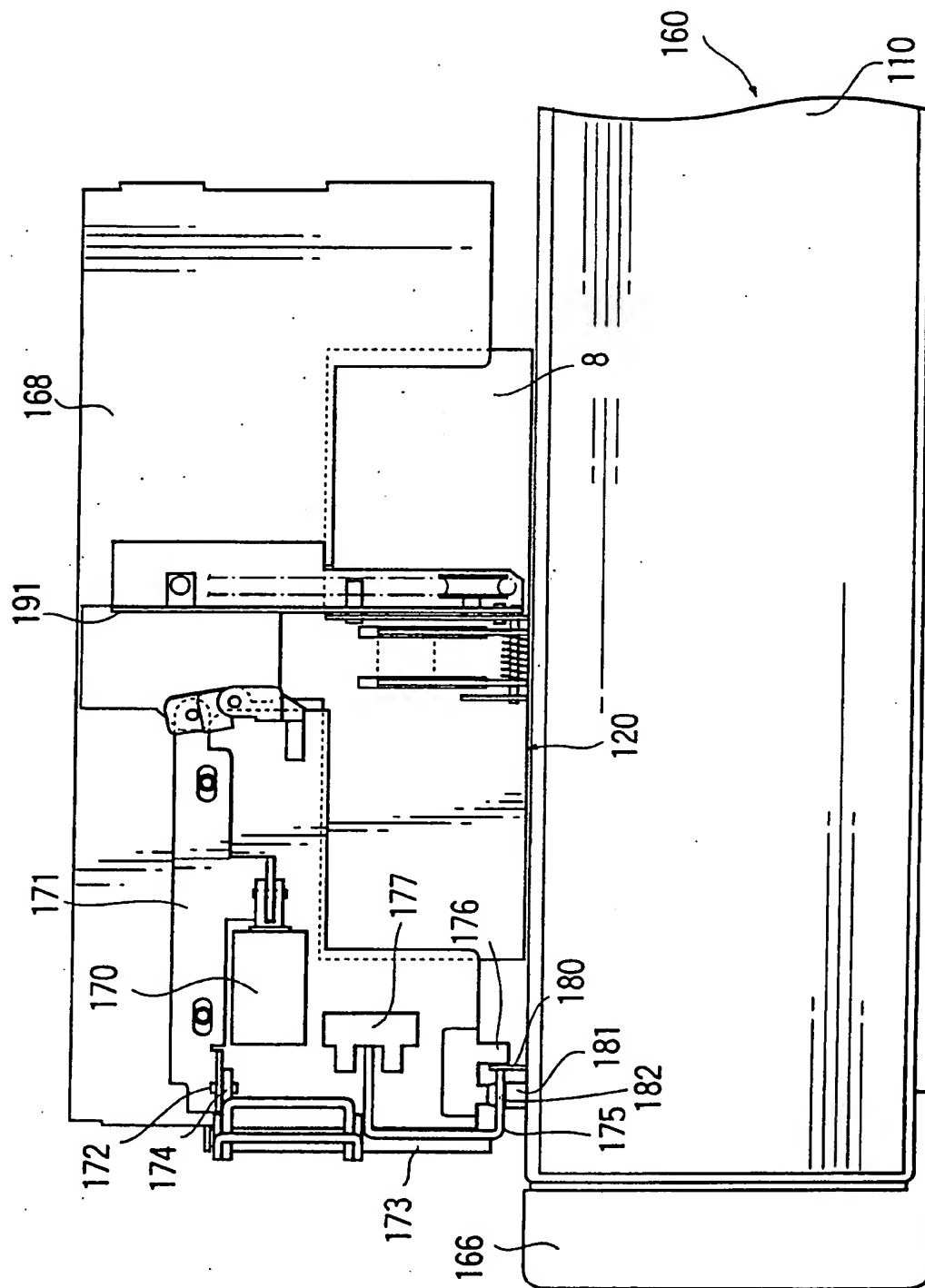




FIG. 18

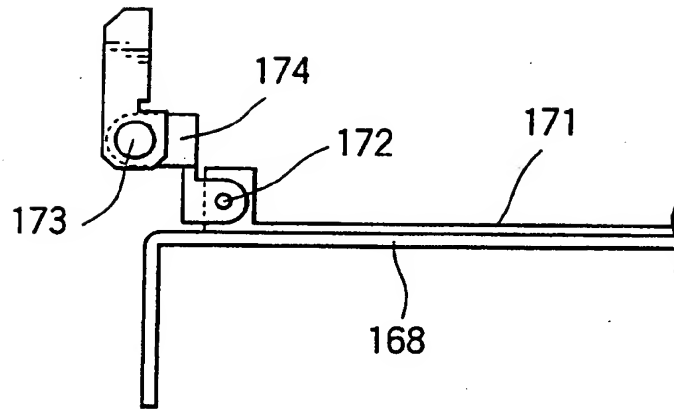


FIG. 19

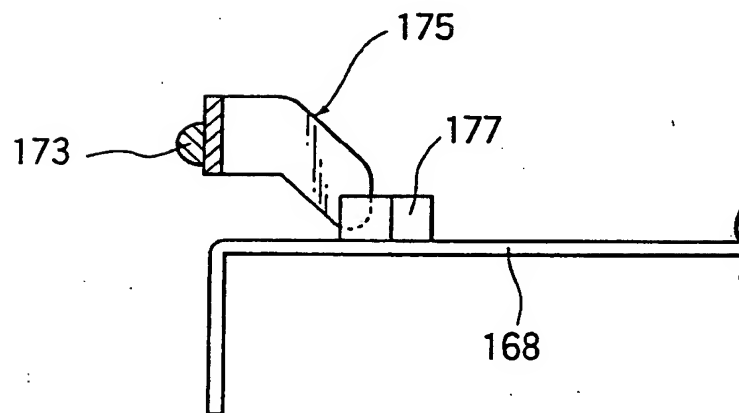


FIG. 20

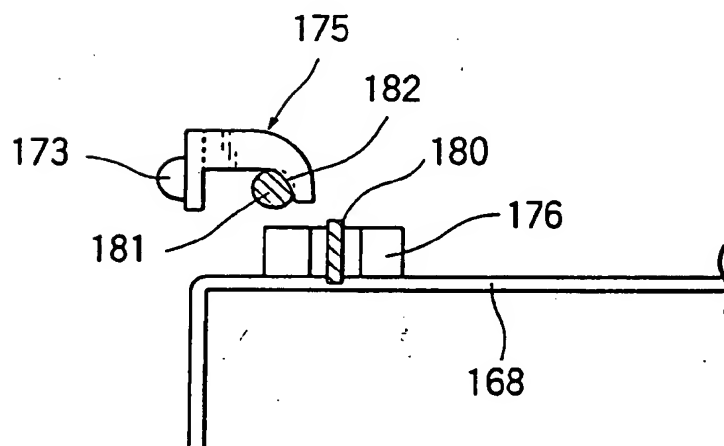


FIG. 21

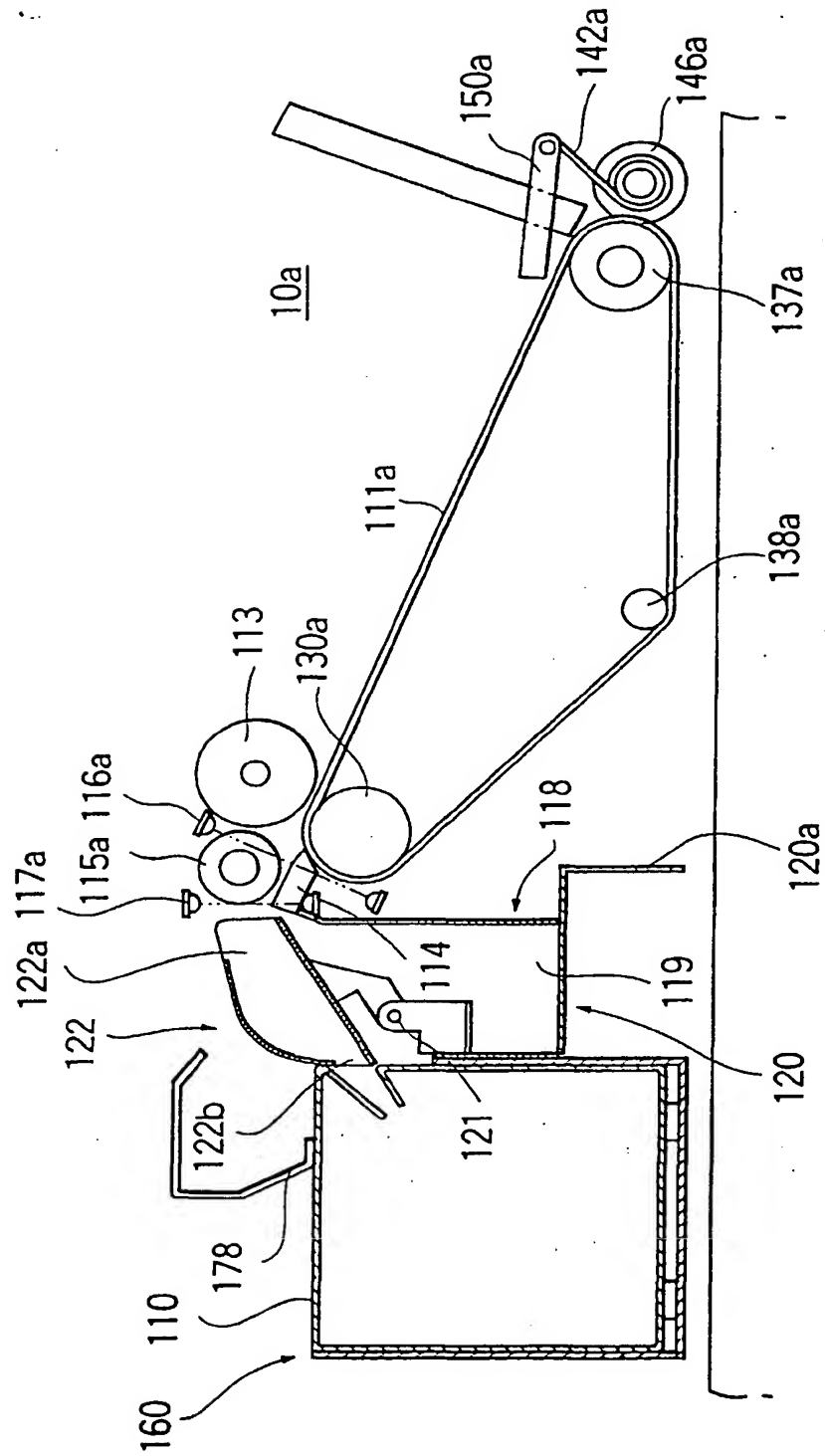


FIG. 22

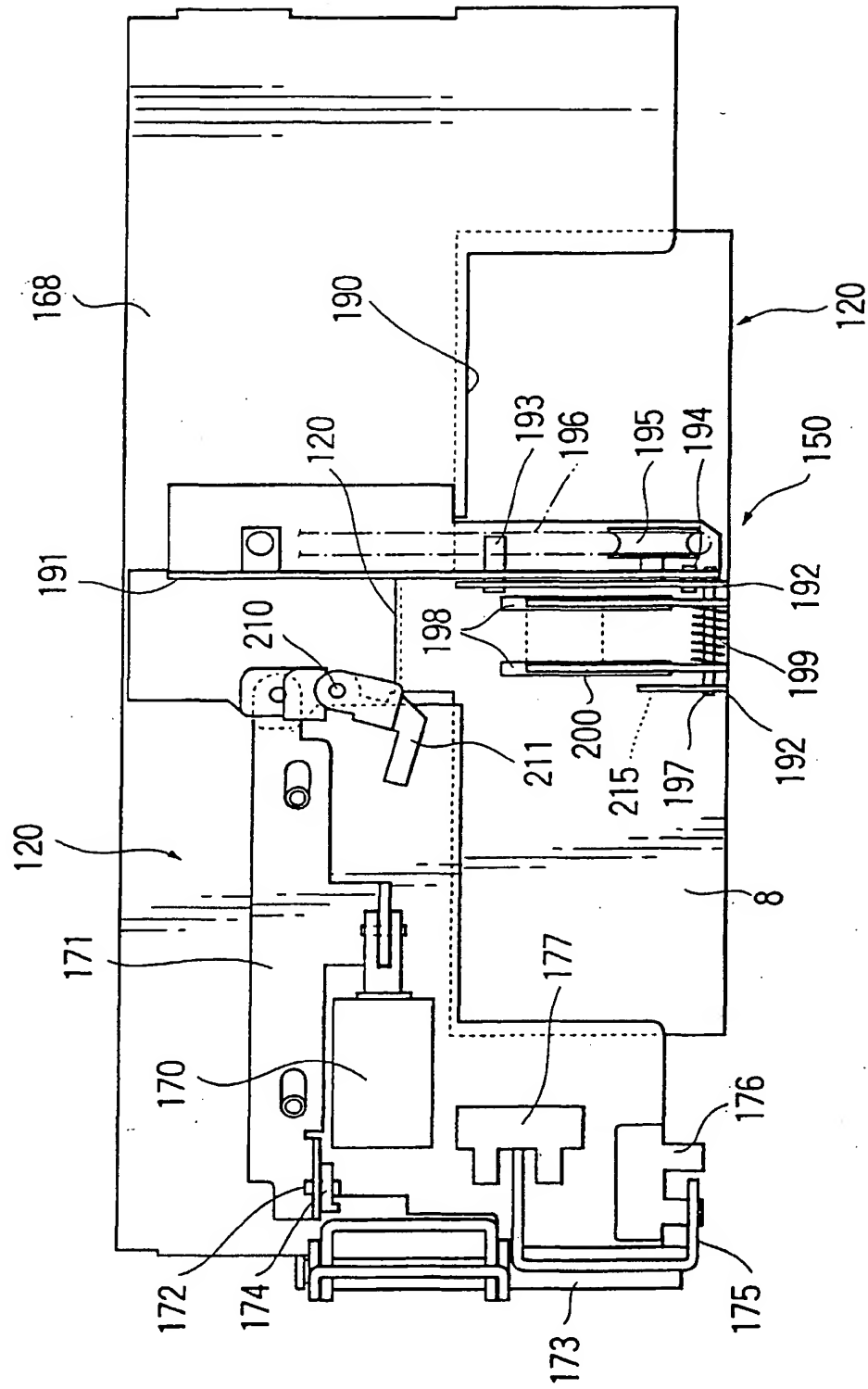


FIG. 23

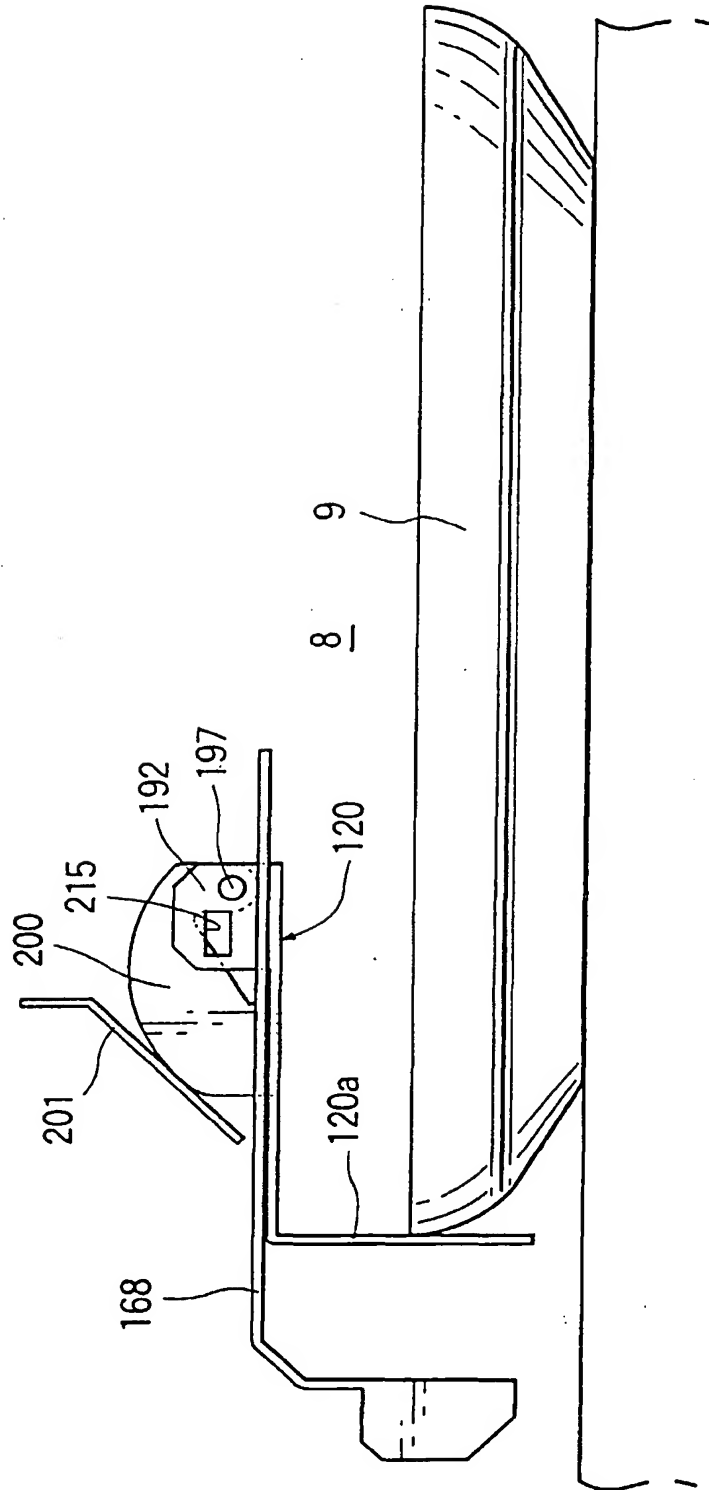


FIG. 24

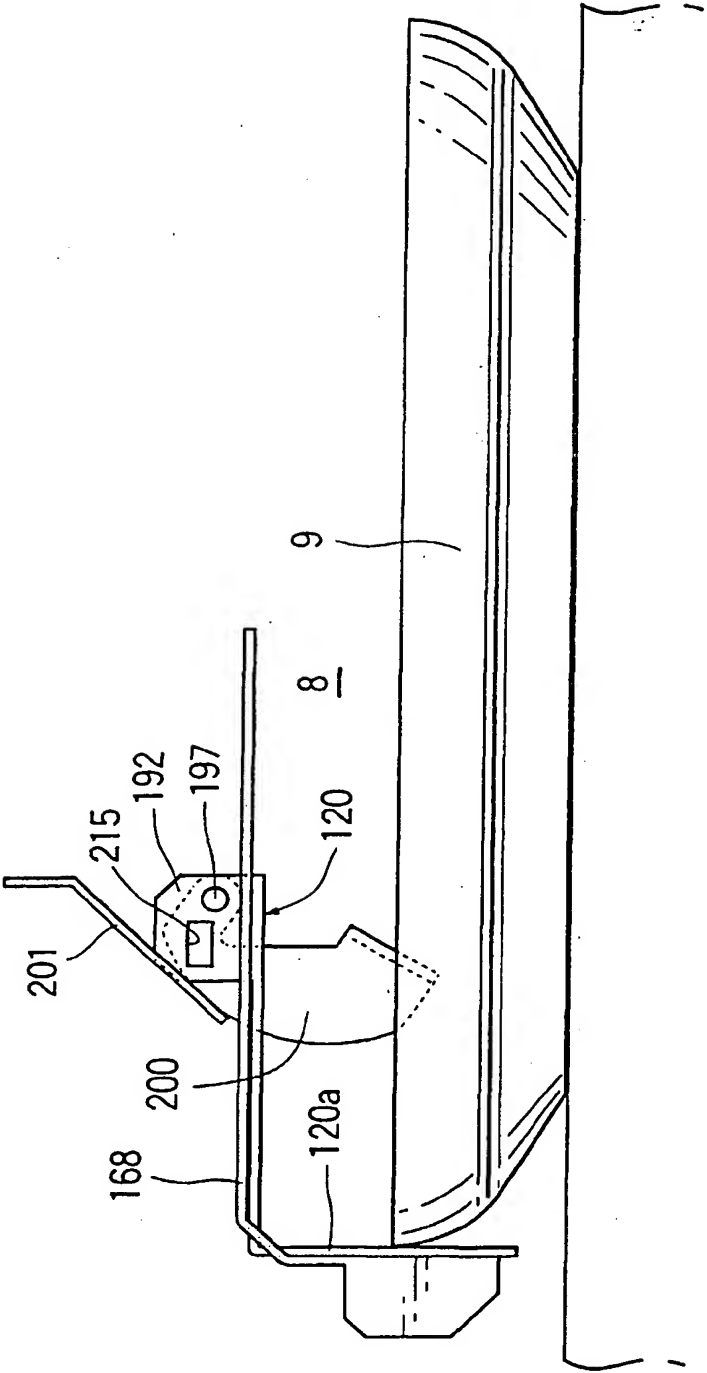


FIG. 25

